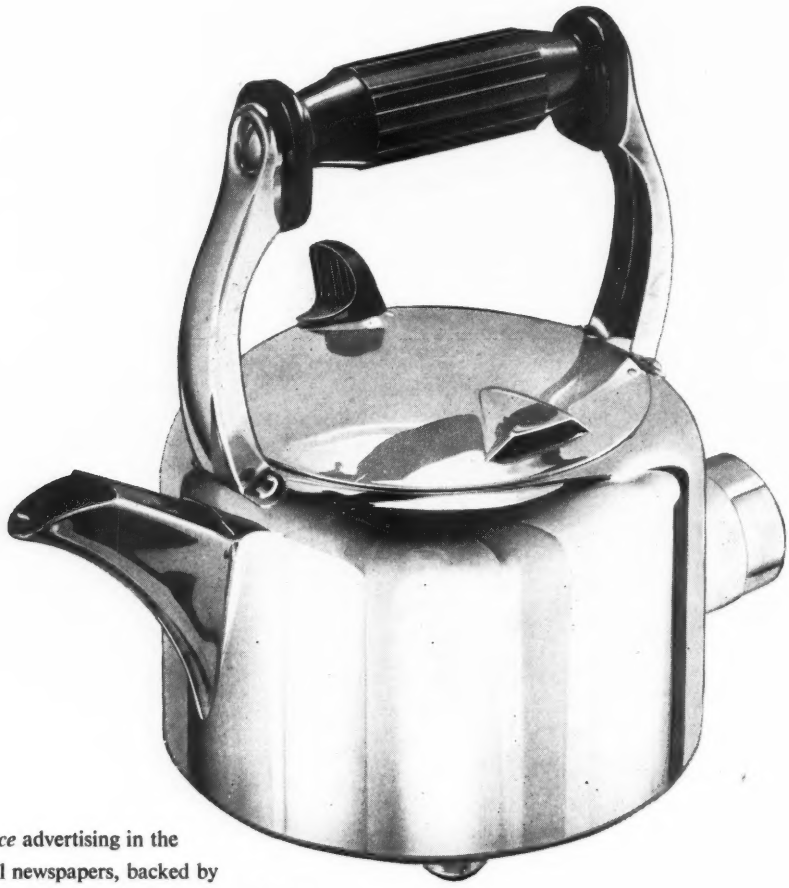
ELECTRICAL REVIEW

* Mineral Insulated

Keep your Sales moving!



Big space advertising in the national newspapers, backed by I.T.V. coverage, is creating increased sales for Swan Brand products — make sure your stocks are ready to meet this demand.

SWAN BRAND

ELECTRICAL APPLIANCES & ALUMINIUM HOLLOWARE

COMMERCIAL TV *is Swan Brand's newest dealer-aid*

Bulpitt & Sons Ltd., Birmingham 18

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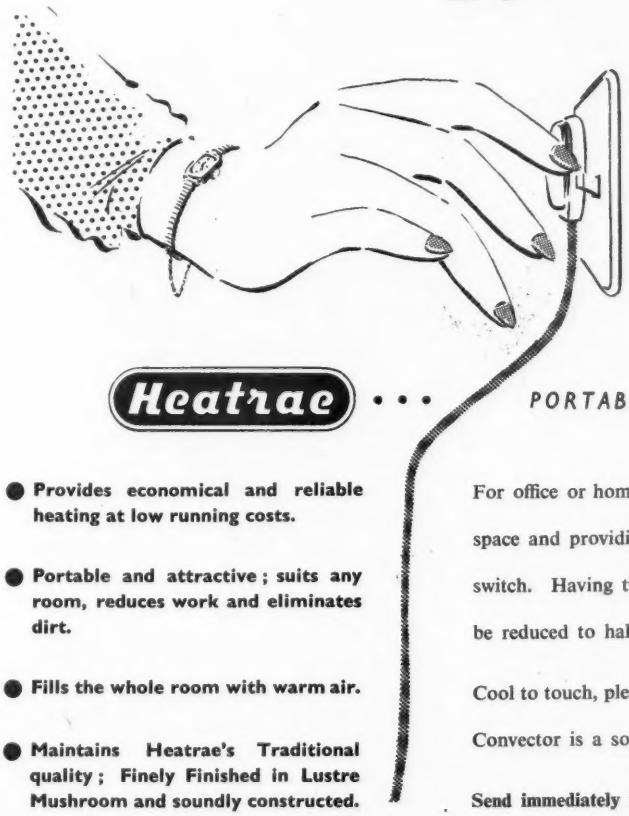
DETROIT

Switch To Comfort



Heatrae • • • PORTABLE ELECTRIC CONVECTOR HEATER

- **Provides economical and reliable heating at low running costs.**
- **Portable and attractive ; suits any room, reduces work and eliminates dirt.**
- **Fills the whole room with warm air.**
- **Maintains Heatrae's Traditional quality ; Finely Finished in Lustre Mushroom and soundly constructed.**

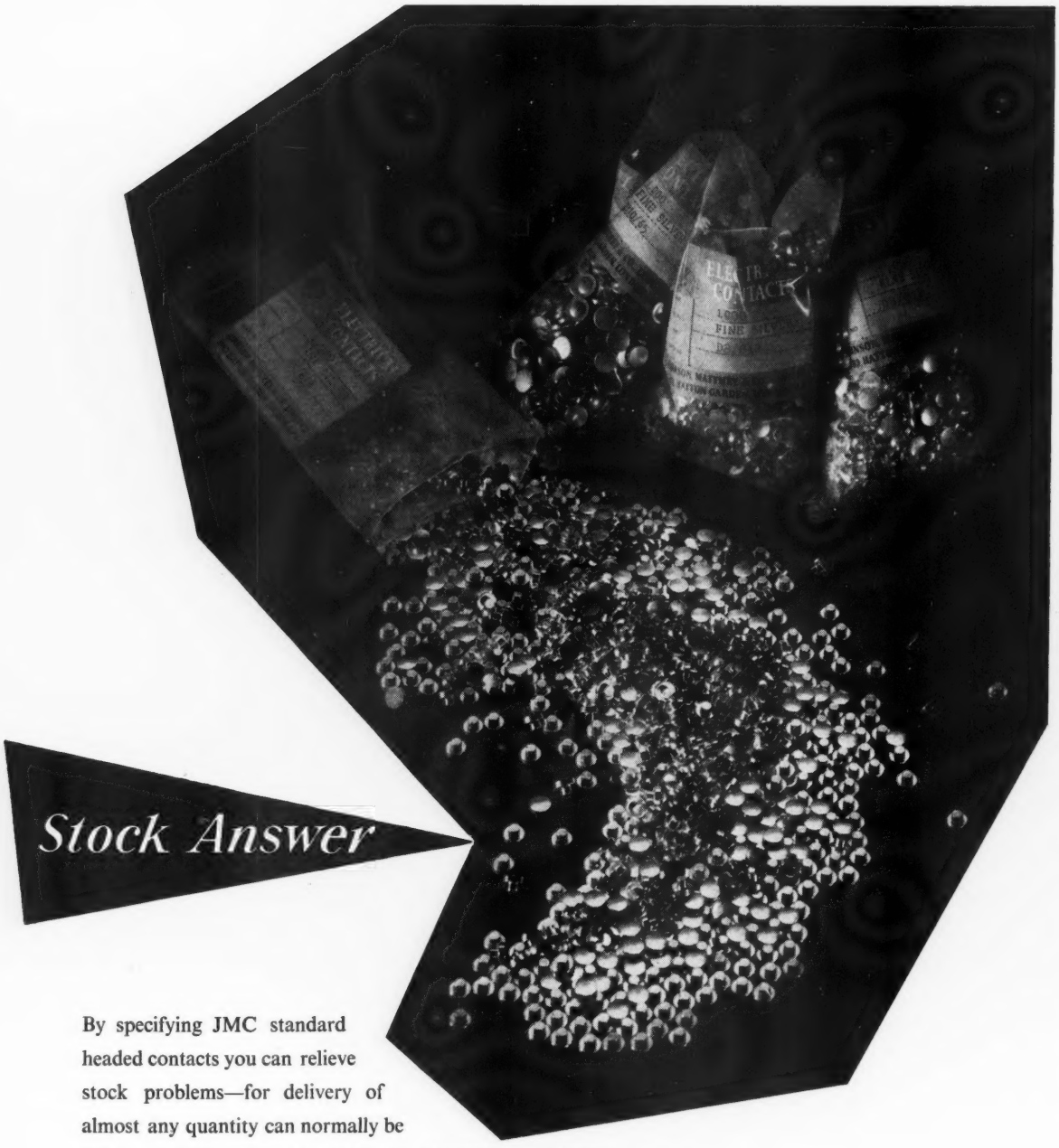
For office or home, this new Heatrae convector is ideal, occupying little floor space and providing comfort throughout the whole room at the touch of a switch. Having two 1 Kw. elements, one controlled by switch, the heater can be reduced to half load depending on the degree of comfort required.

Cool to touch, pleasing to the eye, and giving no fumes, the Heatrae Portable Convector is a sound investment.

Send immediately for our Leaflet No. 86.

HEATRAE LIMITED · NORWICH

Manufacturers of : Electric Water Heaters, Oil Heaters, Immersion Heaters, Urns, Towe lRails, Airing Cupboard Heaters, Flame-proof Heating Apparatus, Electric Fires, Food Trolleys, Warming Plates, Air Heaters.



Stock Answer

By specifying JMC standard headed contacts you can relieve stock problems—for delivery of almost any quantity can normally be made at once. To this, add the advantages of lower cost, sound design and maximum operating efficiency. The stock answer to many problems of contact selection—and a convincing one—is the adoption of JMC standards.

ONE OF THE SPECIALISED PRODUCTS OF

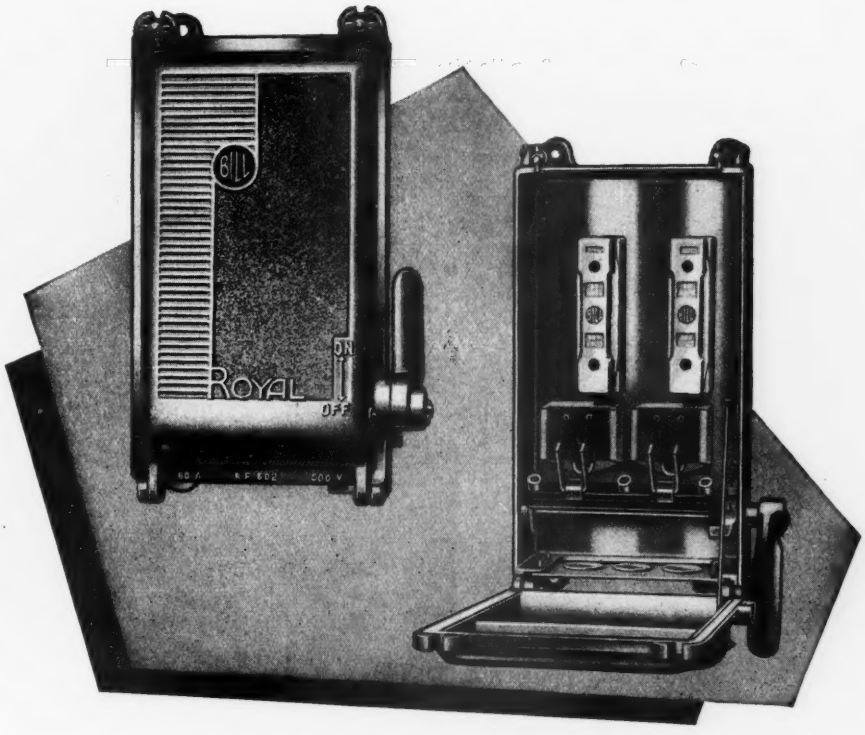
Johnson JMC Matthey

A series of technical data sheets is free on request.

JOHNSON, MATTHEY & CO., LIMITED
73-83 HATTON GARDEN, LONDON, E.C.1. Telephone: Holborn 6989
Vittoria St., Birmingham, 1. Tel.: Central 8004. *75-79 Eyre Street, Sheffield, 1. Tel.: 29212*

SC2

You cannot buy better gear



"ROYAL" SWITCHES AND SWITCHFUSES

- 15 TO 100 AMPERES – 500 VOLT – DOUBLE POLE, TRIPLE POLE, TRIPLE POLE & NEUTRAL.
- H.R.C. OR REWIRABLE FUSES – FULLY INTERCHANGEABLE.
- SUITABLE FOR HEAVY DUTY ON POWER, HEATING & LIGHTING CIRCUITS.
- GENEROUS WIRING FACILITIES.
- MODERN APPEARANCE – SOUND DESIGN.
- IMMEDIATE DELIVERY.

WRITE NOW FOR FULLY DESCRIPTIVE LEAFLET

BILL SWITCHGEAR LTD.
ASTON LANE · PERRY BARR
BIRMINGHAM·20

LONDON. SW1.	MIDLANDS.	NORTH MIDLANDS.	CHELTENHAM	MANCHESTER.3.	BRISTOL.3.	LEEDS.7.	GATESHEAD.8.	GLASGOW.	BELFAST
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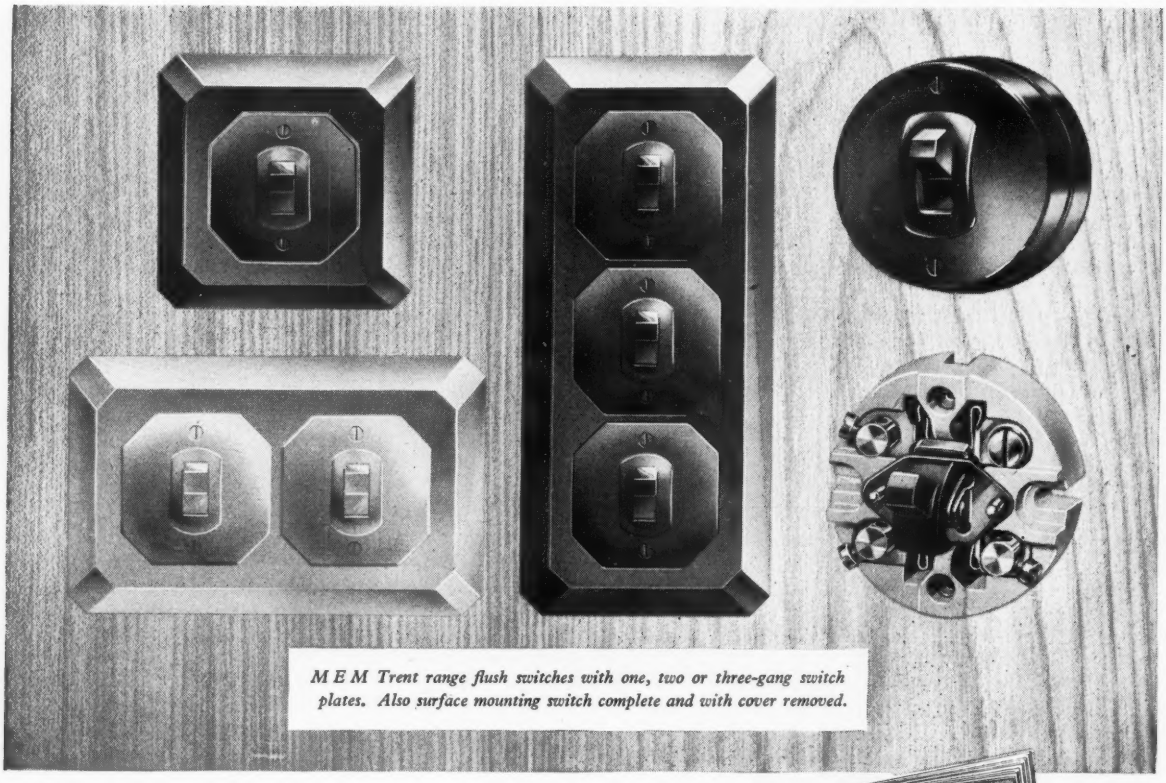
GILLINGHAM ST.	HEAD OFFICE.								

For quick make and break duty

the sturdy, modern

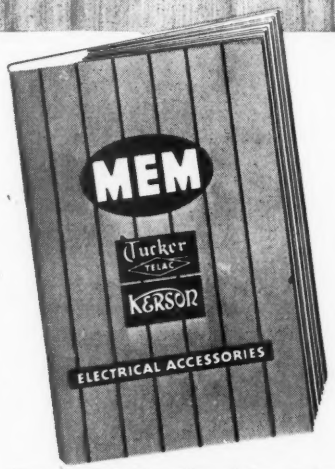
'TRENT' RANGE



M E M Trent range flush switches with one, two or three-gang switch plates. Also surface mounting switch complete and with cover removed.

When you want sturdy switches with quick make and break action, choose the Trent range from M E M-Tucker-Kerson accessories. See how you gain.

- Quick make and break action suitable for AC/DC applications.
- Available in surface, semi-recessed and flush patterns.
- Available in one-way and two-way types.
- Attractive, simple design for modern installation.
- All current carrying parts are mounted on high grade vitreous porcelain.
- Switch plates for flush switches for one, two, three and four-gang.



You get Britain's widest choice of electrical accessories in the new merged M E M-Tucker-Kerson range. Send for Catalogue No. 370 to-day

Tucker TELAC MEM KERSON

MIDLAND ELECTRIC MANUFACTURING CO., LTD., ACCESSORIES DIVISION, REDDINGS LANE, TYSELEY, BIRMINGHAM, 11

There's a KING PULLEY BLOCK for every load

The KING range of electrically powered pulley blocks starts with the Matom model—an armful of ingenuity which lifts 200 lb. at 50 ft. per minute —and ends with the mighty Mammoth which has a capacity of up to 10 tons. *(Both are illustrated here.)* In between is the most comprehensive range of blocks in the country. All types of suspension methods and current supplies are provided for. You will find we have special equipment to handle the most unusual loads. Every KING pulley block is individually tested. Chains and materials are well in excess of statutory requirements. Design is constantly being modified in the light of our Development Department's findings. Operation is by pendent push control from hoist, or remote control. Patented safety features are incorporated and prices are highly competitive.

Why not write for our catalogue? Full details need far more space than is available to us here. We also manufacture manually operated pulley blocks.

KING
REGISTERED TRADE MARK

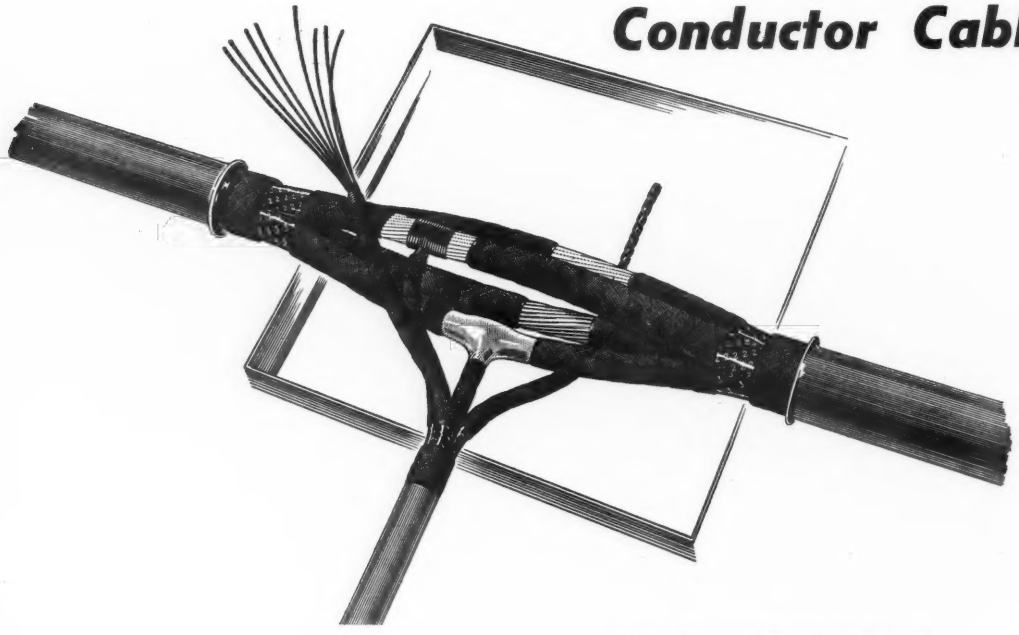
ELECTRIC PULLEY BLOCKS

Covered by British and Foreign Patents

Write for Catalogue PB.7 to

GEO. W. KING LTD., ARGYLE WORKS, STEVENAGE, HERTS. TEL: STEVENAGE 440

Safe, Simple jointing of Aluminium Conductor Cables



with FRY'S NEW ALCA-P SOLDER

ALCA-P is cadmium-free, cannot harm operatives.

ALCA-P offers lower working temperature, increasing wetting and tinning functions with reduced risk of charring insulation.

ALCA-P prevents sinkage within weak back ferrules eliminating the need for stick filling and the danger of cold shuts and cavitation.

ALCA-P offers rapid solidification allowing the jointer to commence work immediately on further joints without the risk of disturbing the plastic condition.

KYNAL FLUX is produced especially for use with ALCA-P. KYNAL removes oxide film from aluminium and promotes rapid wetting. KYNAL ensures the elimination of corrosive after-effects.

Full details and samples from :

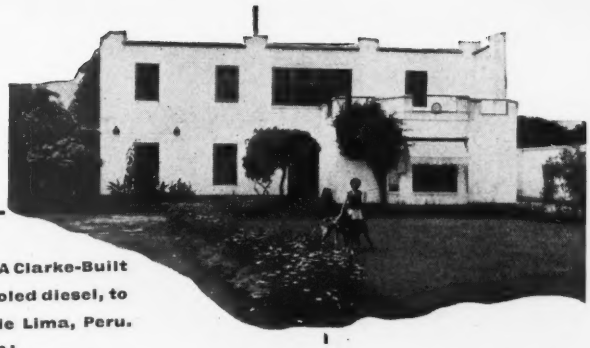
FRY'S Metal Foundries Limited

Tandem Works, Merton Abbey, LONDON, S.W.19. Telephone: MITcham 4023

And at :
MANCHESTER · GLASGOW · BRISTOL · DUBLIN

MRP72

. . . on a farm in Peru



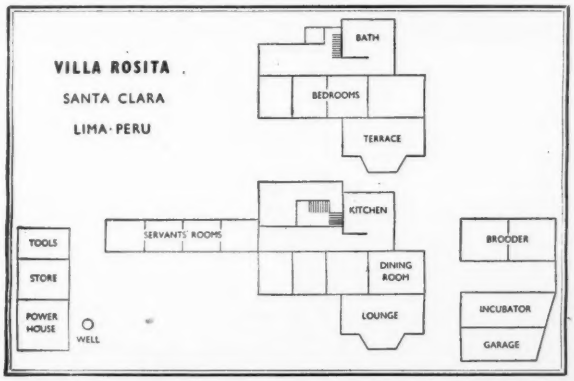
Three years ago, Mr. H. Kent Atkinson purchased an 8-KVA Clarke-Built generating set with Armstrong Siddeley 2-cylinder air-cooled diesel, to operate lighting and plant on his chicken farm outside Lima, Peru. These are extracts from a recent letter from Mr. Atkinson:

Instant starting

"The set is equipped with electric starting from a 12-volt car-type battery, with two remote-control stations in the house which is situated about 40 direct yards from the "power house". Any time that power is required in the house, my wife or servants have only to push the button in the kitchen downstairs or in the master bedroom upstairs, and the plant starts up automatically."

10,000 hours without replacing a part

"The plant has now run over 10,000 hours in the three years' service and has not had one single part replaced through wear. It is never necessary to add oil to the crankcase between drain-and-refill periods."



Seven months continuous running

"For one period of incubating and chick-rearing, the plant was running continuously for seven months. On this continuous service it was found necessary only to change the oil, etc. every 400 hours. This regular maintenance job takes one hour's attention per month and is practically all the attention the plant calls for.

"The cylinder heads have been removed only twice in the three years for the cleaning of carbon from the heads and piston crowns and for grinding-in the valves—these "decokes" were not done because of signs of distress from the engine. The job took six hours in each case with no outside assistance.

"The electric household and workshop appliances have multiplied enormously since the installation of this set and now include the following (in addition to some 40 lights):—

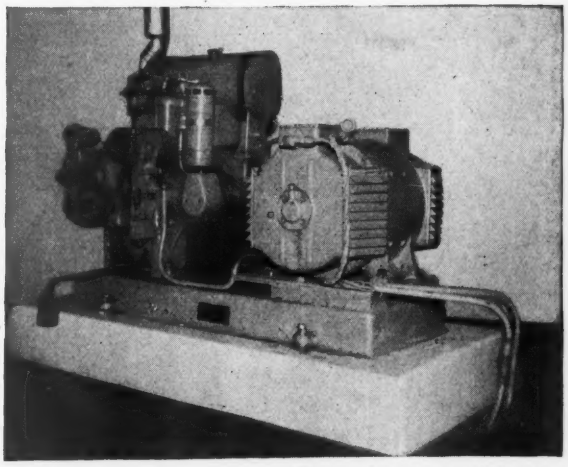
2 WATER HEATERS • WASHING MACHINE • 2 ELECTRIC IRONS
WAFFLE IRON • GRAMOPHONE PICK-UP • 2 FANS
DEEP WELL WATER PUMP • FUEL PUMP FROM BULK SUPPLY TANK
ELECTRIC MIXER • ELECTRIC BROILER • VACUUM CLEANER
FLOOR POLISHER • 3 ELECTRIC FIRES • MOVIE PROJECTOR
RADIO • TAPE RECORDER • ELECTRIC RAZOR • SOLDERING IRON
INCUBATOR • INFRA-RED CHICK REARERS • CHAFF-CUTTER
ELECTRIC WELDER • GRINDING & BUFFING WHEELS • CIRCULAR SAW
PAINT SPRAYER • FLEXIBLE SHAFT TOOL-HOLDER

"Whilst it is true that all these appliances can never be in use at the same time, the engine always has plenty of power and has never shown signs of over-heating.

"I have no hesitation in recommending the air-cooled Armstrong Siddeley unit to anyone who is away from municipal power supplies."

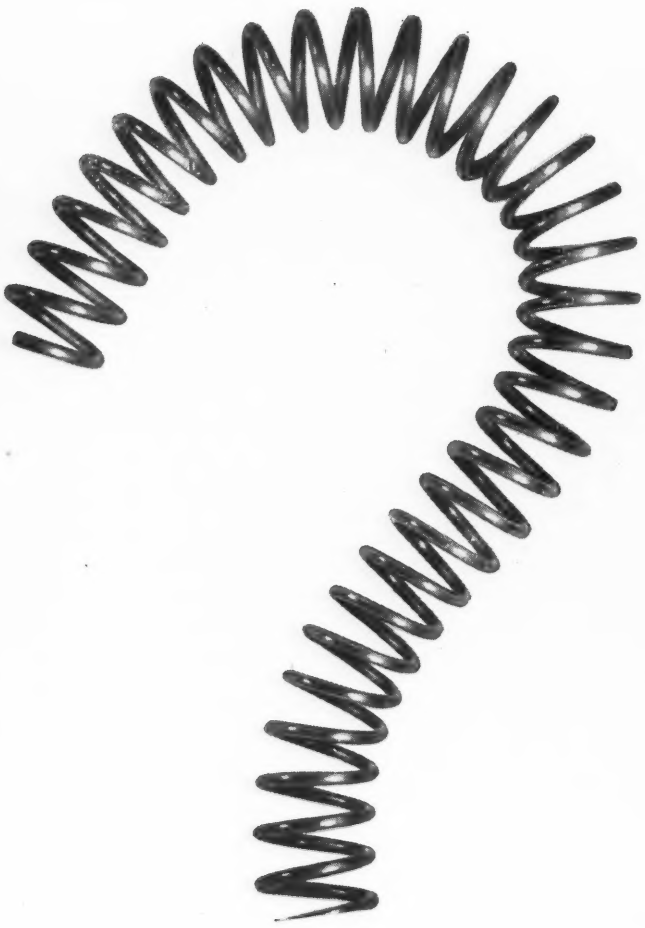
This record of reliability can be repeated in every one of the scores of industries in which Armstrong Siddeley Air-Cooled Diesels provide power.

THREE MODELS FROM 6 TO 33 H.P. SEND NOW FOR LEAFLETS



The generating set in situ at the Lima farm

ARMSTRONG SIDDELEY (BROCKWORTH) LTD
HUCCLECOTE • GLOUCESTER
TELEPHONE: GLOUCESTER 21531 • TELEGRAMS: BROCKARM, GLOUCESTER



Stuck for a Spring?

If so, Terry's BOXES OF ASSORTED SPRINGS are the answer. Here you have a marvellous assortment of Compression and Expansion springs . . . in all varieties, weights, lengths, gauges and diameters. The 9 boxes we show here are only a few from our very wide and varied range. Let us send you a fully illustrated list—post free.

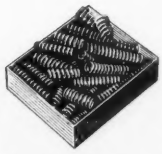
TERRY'S

ASSORTED SPRINGS

HERBERT TERRY & SONS LIMITED · REDDITCH · WORCS

(Makers of fine Springs, Wireforms and Presswork for over a century)

No. 760. 3 doz. Assorted Light Compression Springs 1″ to 4″ long, 22 to 18 S.W.G., ¼″ to ½″ diam. 6/6 each.



No. 98A. 3 doz. Assorted 1″ to 4″ long, ½″ to ¾″ diam., 19G to 15G. 5/6 each.

No. 757. Extra Light Compression, 1 gross Assorted, ⅛″ to ⅝″, ¼″ to 2″ long, 27 to 20 S.W.G. 15/- each.

No. 388. ½ gross Assorted Small Expansion Springs. ¾″ to 1½″, 18G to 21G. 9/6 each.

No. 758. Fine Expansion Springs. 1 gross Assorted ¼″ to ⅝″, ½″ to 2″ long, 27 to 20 S.W.G. 15/- each.

No. 466. ½ gross Assorted Small Expansion Springs ⅜″ to 1½″ long, 3/32″ to 3/16″ diam., 21G to 24G. 6/6 each.

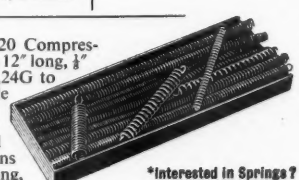
No. 1013. 1 gross Small Coil Compression Springs, ⅜″ to 1⅛″ long, 3/32″ to 7/16″ diam., 24G to 19G. 6/- each.

No. 753. 3 doz. Assorted Light Expansion ¼″ to ½″ diam., 2″ to 6″ long, 22 to 18 S.W.G. 10/6 each.

Cut Production costs with TERRY Wire Circlips *(Square Section)*

We can supply from stock in sizes from ¼″ to ⅝″.

No. 1024. 20 Compression Springs 12″ long, ⅛″ to ½″ diam.,24G to 18G, suitable for cutting into shorter lengths; and 30 Expansions 1½″ to 12″ long, 5/32″ to ⅜″ diam., 22G to 16G. 24/- each.



*Interested in Springs? 1957 Editorial Spring Design and Calculation—post free 12/6

HT22

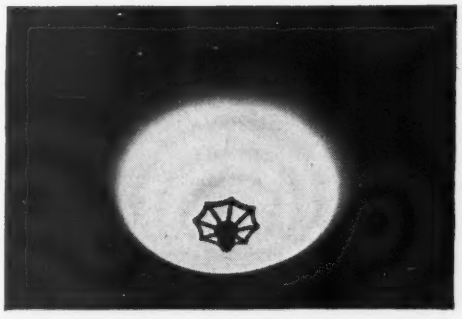
'Perspex' lighting fittings in Swan and Edgar's manufactured by G.E.C.

As good as new after eight years use

Lighting fittings made from 'Perspex' were fitted in Swan and Edgar's Piccadilly store in 1949. Today after 8 years use they are as decorative and efficient as when they were first installed.

'Perspex' lighting fittings combine attractive appearance with durability throughout a very long life. This tough, light, material is unaffected by atmospheric changes and does not age. Its strength minimises risk of breakage during cleaning and maintenance is simplified.

'Perspex' acrylic sheet is easy to shape to attractive modern designs and is available in many grades having suitable optical characteristics.



'Perspex' acrylic sheet is suitable for many varied uses in interior decoration and display and modern designers are making increasing use of this versatile material.

'PERSPEX' **TODAY—FOR TOMORROW**

'Perspex' is the registered trade mark for the acrylic sheet made by I.C.I.

IMPERIAL CHEMICAL INDUSTRIES LIMITED · LONDON · S.W.1

FP.56

For wider scope in design...

Permaglass Fan baffle moulded in two sections.

lower tooling costs and product improvement

PERMAGLASS

GLASS FIBRE REINFORCED PLASTIC MATERIALS

based on Polyester, Epoxide, Phenolic, and Melamine resins.

Available in :—

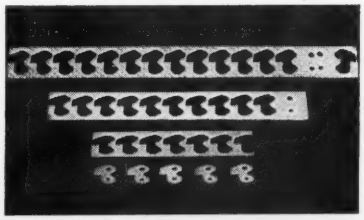
FLAT SHEET—for punched and machined electrical components

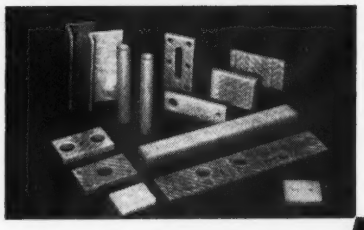
TUBES—for operating poles, shafts and A.C.P. Bodies

MOULDINGS (large or small)—contact, matched metal die.

STRONG, LIGHT, and DURABLE, under all operating conditions, with good dielectric properties. Backed by 20 years experience in the production of laminated plastics.

Keep abreast of developments—write for technical data sheet H.1.—or send us your print for quotation.





(Left.) Electrical components punched from flat Permaglass sheet.

(Left below.) Punched and and machined Permaglass items.

(Below.) Carrying case for resuscitator equipment, made of two Permaglass matched metal mouldings—supplied to the British Oxygen Co. Ltd.

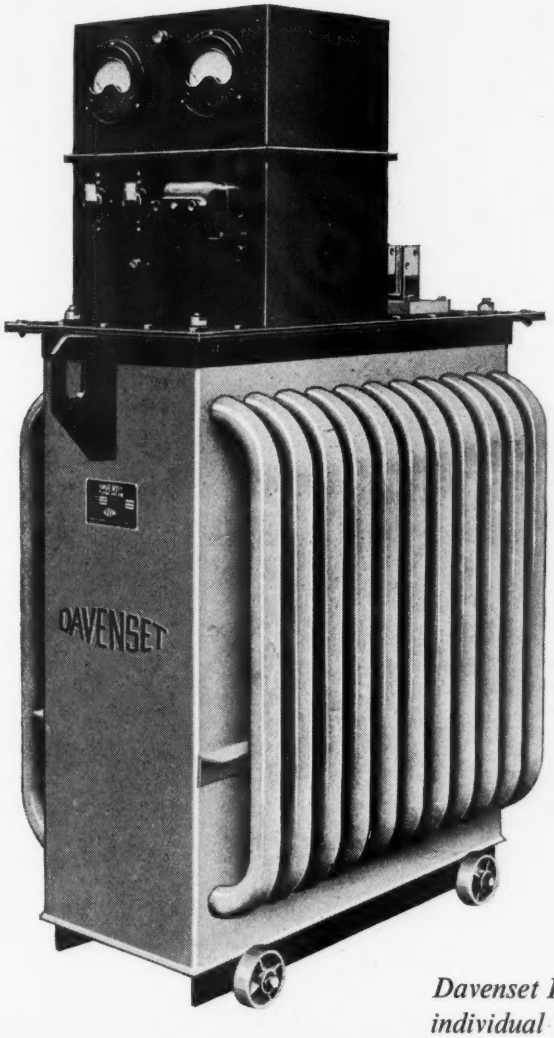
Sole Manufacturers

PERMALI LIMITED

Permaglass Division

GLOUCESTER · ENGLAND · TELEPHONE: 24941

Power for plating



- No maintenance of any type needed.
- No moving parts to break down
- Close control of plating voltage by transformer tapping switches

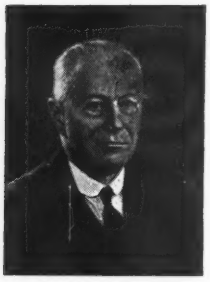
- Simple to install alongside bath
- No rheostats to wear out
- Conservatively rated for continuous duty at full load

- Low in price—high in efficiency
- Popular sizes always in stock
- Quick delivery

Davenset Plating Rectifiers are being used extensively as individual units or in banks in the U.K. and overseas

DAVENSET TRANSFORMER RECTIFIER SETS
for **CONTINUOUS DUTY AT FULL LOAD**

PARTRIDGE WILSON & CO. LTD • LEICESTER • ENGLAND



1912 - 1957

THE STORY OF

BELLING & COMPANY LIMITED

No. 32 OCTOBER 1957

The time is here again for my half-yearly report, and I am glad to say it is a pleasant one at any rate.

Our production and sales are just about 22% up on the same period of last year, and as we have further equipment and space coming into use every day, we all hope to reach, with your help, the target we set ourselves, namely 25% up on last year.

We have had a very steady year's business so far and have as a matter of fact been obliged to increase considerably the number of workers we employ. We have also strengthened up our testing equipment and inspection departments both at Enfield and Burnley with very gratifying results.

Our new catalogue has been well received, and we have included further suggestions from many sources. The size has been altered to avoid any confusion with last year's catalogue, as the new one contains all our up-to-date prices.

Unfortunately, we have had to increase many of these prices. In the past we have been able to absorb wage and material increases by introducing improved methods of production, but having now installed all the latest plant available we are not at present able to carry any additional increased costs. All we can do now is to try to increase our sales, maintaining our present on-costs as closely as possible.

Incidentally, our percentage of profit on sales is rather too small at present, and so this also calls for increased production, at little extra on-cost.

Although we say quite clearly in our catalogue that three of our new lines will not be ready for delivery until early 1958, orders for them are already rather staggering. The Twin Baby Belling is going to be an absolute winner (it is really wonderful what you can cook on it), whilst the new No. 52 Baby Belling is also being ordered freely, and personally I think it may even knock out the No. 45A cooker.

The Phantom fan-heater is a revival of one we had some 17 years ago and although rather dear, will I think be a very good selling line.

The Radiant Zephyr, with a reflector-type element, exactly meets the requirements of many people who want combined radiant and convected heat, and the revised County fire, now called the Countess, is a most attractive design.

The horizontal model, 47H, which is very like a cooker we had in our catalogue 30 years ago when we were much ahead of the time, is being asked for from many quarters. The oven is unquestionably in the right position, and so is the grill, which is just below hob level and enables the user to pull out the grill pan easily and look down on the grill or the toast and see how it is going on. In this position the pan is easily and safely handled.

I must stop this selling talk about our new products and get down to earth and give you a broad picture of our general position. This I can say is very sound. We have made about the same profit so far this year, but on a bigger turnover, thus reducing our percentage, but I am again paying out a similar interim bonus to that paid last year to all our employees.

With regard to the last six months of this year, prospects look good to me, if the 7% Bank Rate does not slow things up too much.

If we do reach our target of a 25% increase in production and sales over the whole year, which with your help I think we can do, our margin of profit will go up a little and then we shall all be happy.

My usual report on the year's work will, of course, all being well, be issued next April.

In the meantime many thanks to everyone.

C. A. Belling.

Belling & Co. Ltd., Bridge Works, Enfield, Middx. HOWard 1212

ON LAND, SEA OR AIR . . .

You can count on cable jacketed with Du Pont neoprene

Durable jacketing of Du Pont neoprene lowers maintenance and replacement costs wherever cable is used. It resists sunlight, weathering and heat on aerial cable . . . withstands soil acids and electrolytic attack on cable buried directly in earth . . . stands up to salt water, oil and grease on cables aboard ship. You can count on extra durability, maximum protection when your cable is jacketed with Du Pont neoprene. Ask your supplier to show you his stock of neoprene-jacketed cable.

Neoprene/Hypalon products are made in this country. For details of suppliers or any other information required please write to the sole distributors in the U.K.

Durham Row Materials Ltd., 1-4 Great Tower Street, London E.C.3.

New ways in which neoprene-made products effect savings for you are contained in every issue of the Neoprene Notebook. New and unusual applications are clearly shown. Get on the mailing list. Fill out and mail the coupon today.

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NEOPRENE

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

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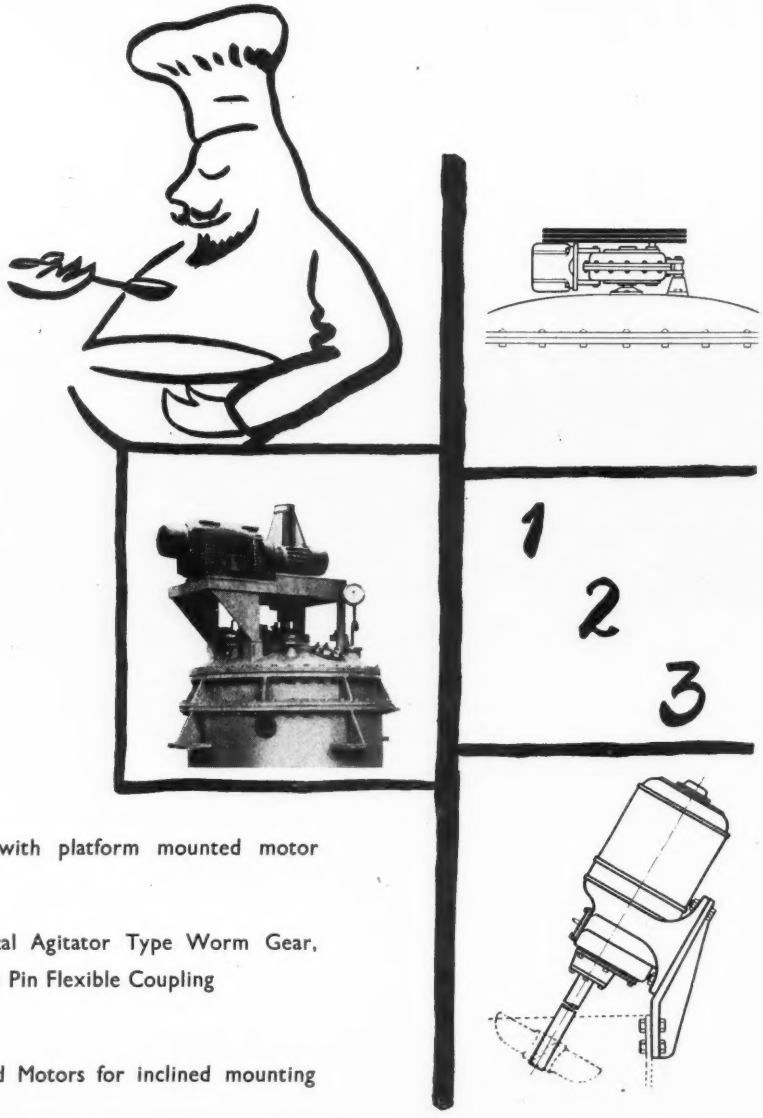
MIXING
in the best circles



Three typical applications of CROFTS MIXER DRIVES

1 Shaft Mounted Gear Unit with platform mounted motor
Publication 655

2 Radiation Fan Cooled Vertical Agitator Type Worm Gear, motor driven through Crown Pin Flexible Coupling
Worm Gear Catalogue 152

3 Ritespeed 'Efficiency' Geared Motors for inclined mounting

Crofts

CROFTS (ENGINEERS) LIMITED

BRADFORD 3 ENGLAND

Tel.: 65251 (20 lines) Grams: 'Crofters Bradford Telex' Telex: 51186

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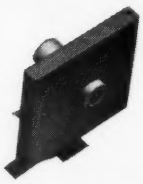
To illustrate the extreme hardness of SINTOX Industrial Ceramic, the photograph on the right shows a ¼" diameter tube of SINTOX which, without even chipping, was forced through a ¼" thick mild steel plate.



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Compared to porcelain, in tension, compression and cross breaking, SINTOX has at least twice the strength ; and insulating properties twice as good.

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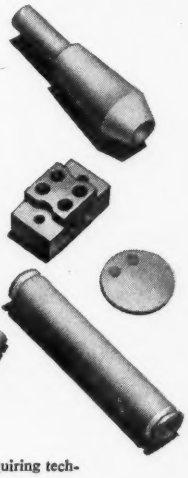

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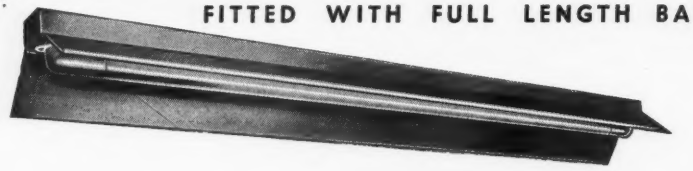

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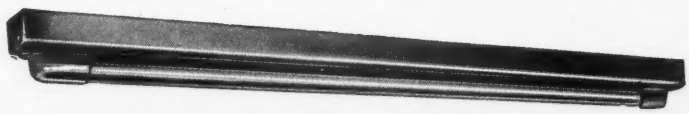

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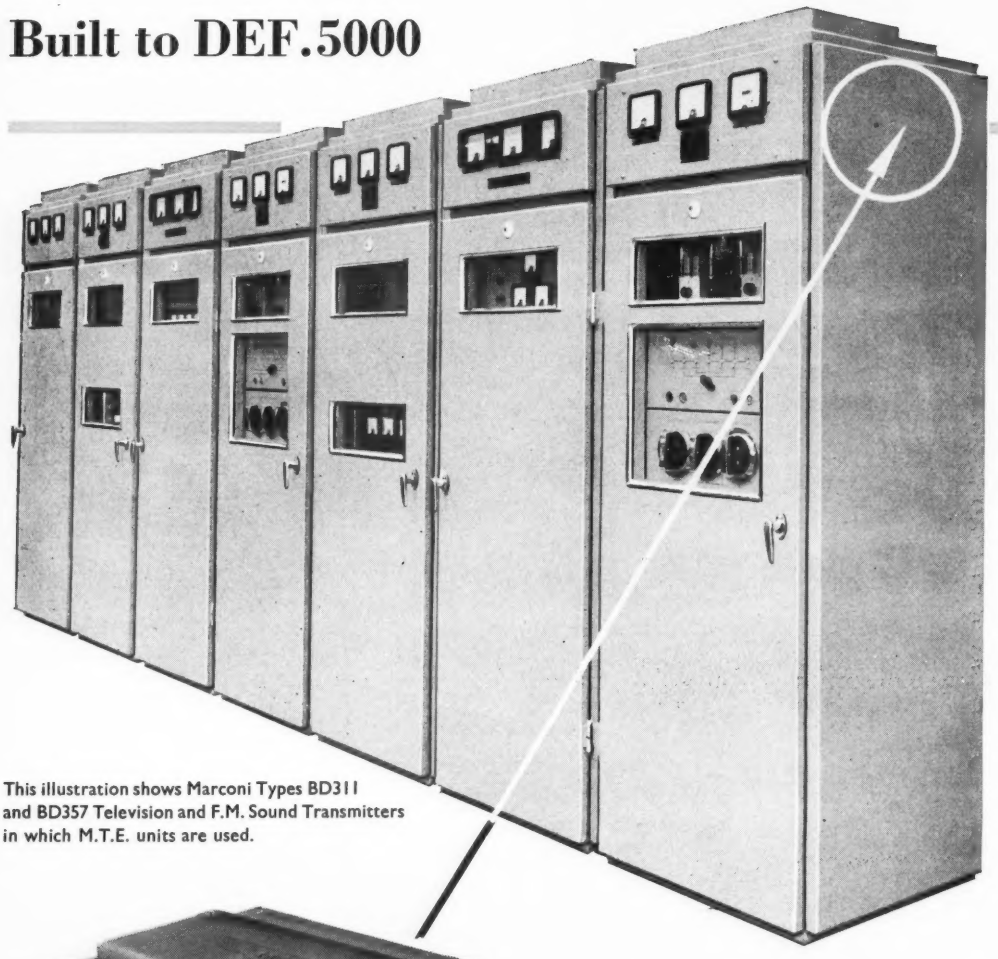
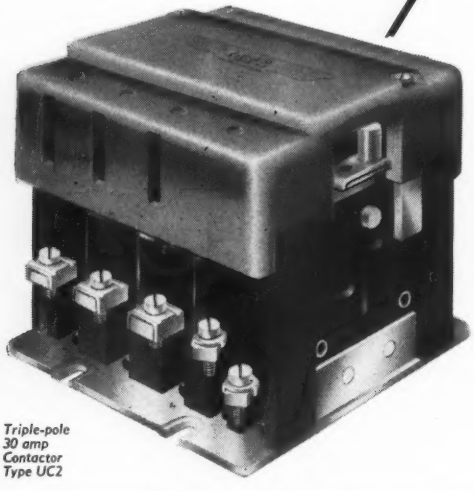


This illustration shows Marconi Types BD311 and BD357 Television and F.M. Sound Transmitters in which M.T.E. units are used.



Triple-pole 30 amp Contactor Type UC2

MARCONI'S WIRELESS TELEGRAPH COMPANY LIMITED is one of the many famous names in British industry making increasing use of M.T.E. "Progress" contactors, relays and other components.

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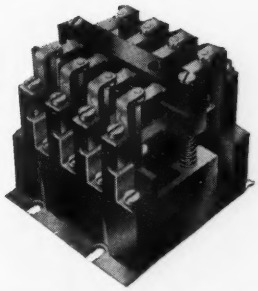
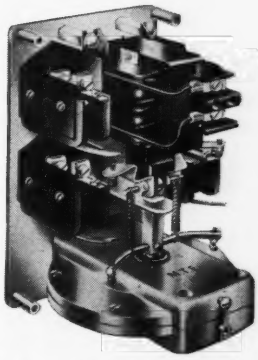
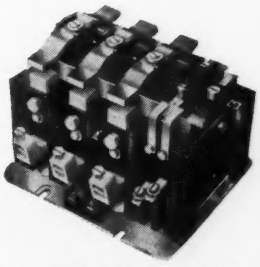


TYPE URI EIGHT-POLE DOUBLE-BREAK RELAY (cover removed)



TYPE UT ELECTRO-PNEUMATIC TIMER (cover removed)



TYPE UC3 75 AMP CONTACTOR (cover removed)

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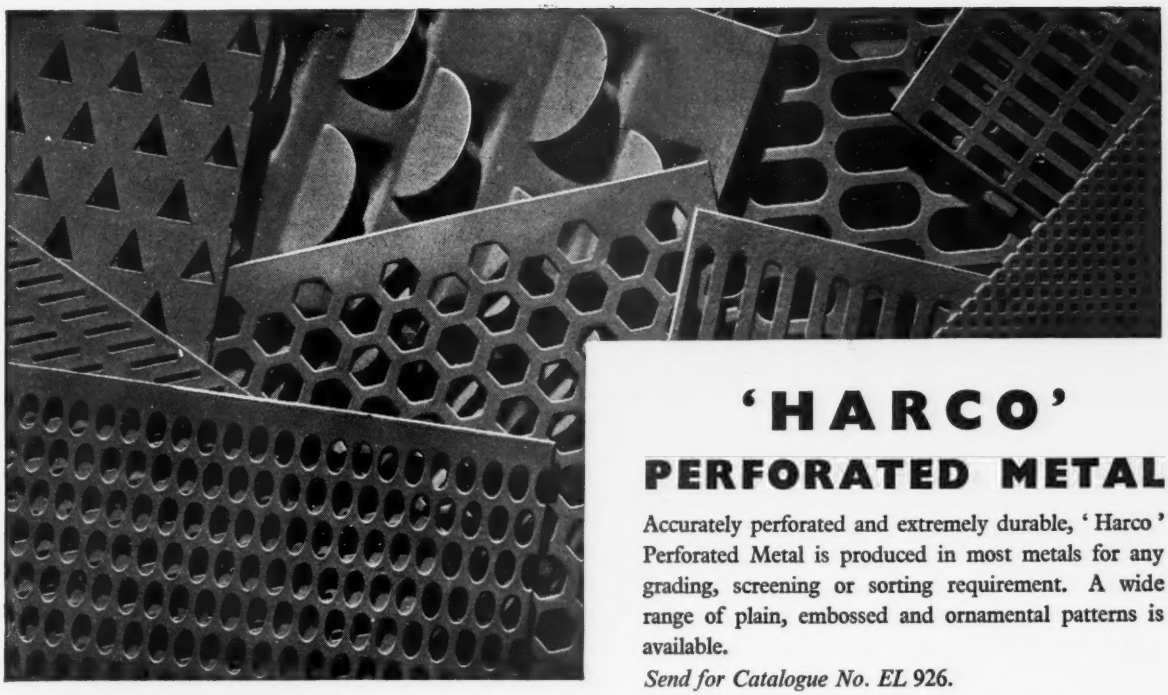

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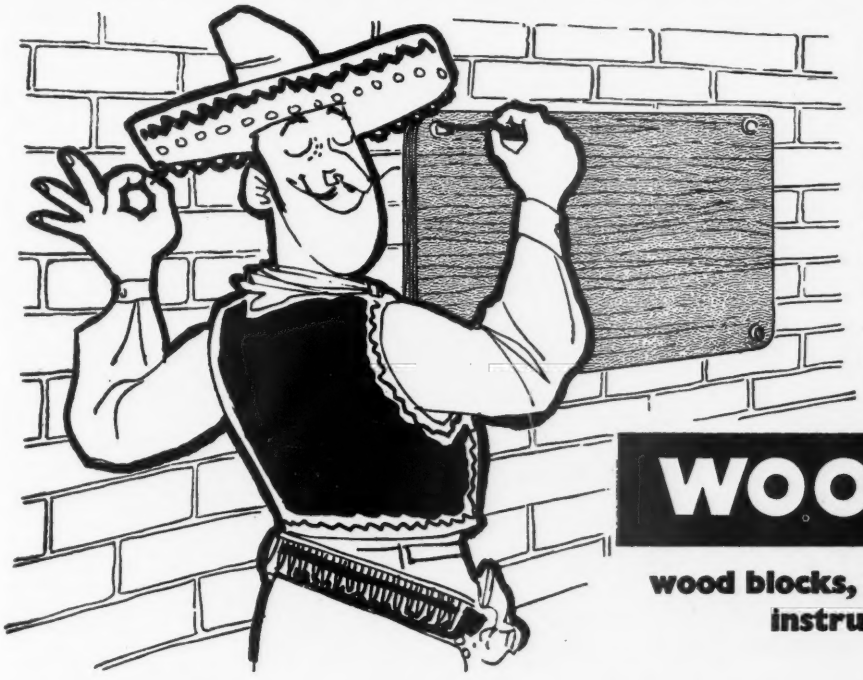

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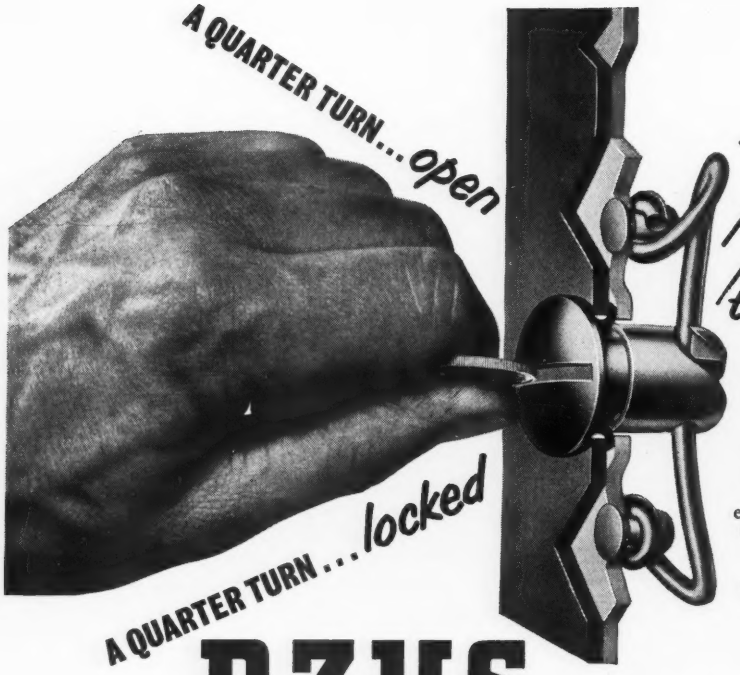

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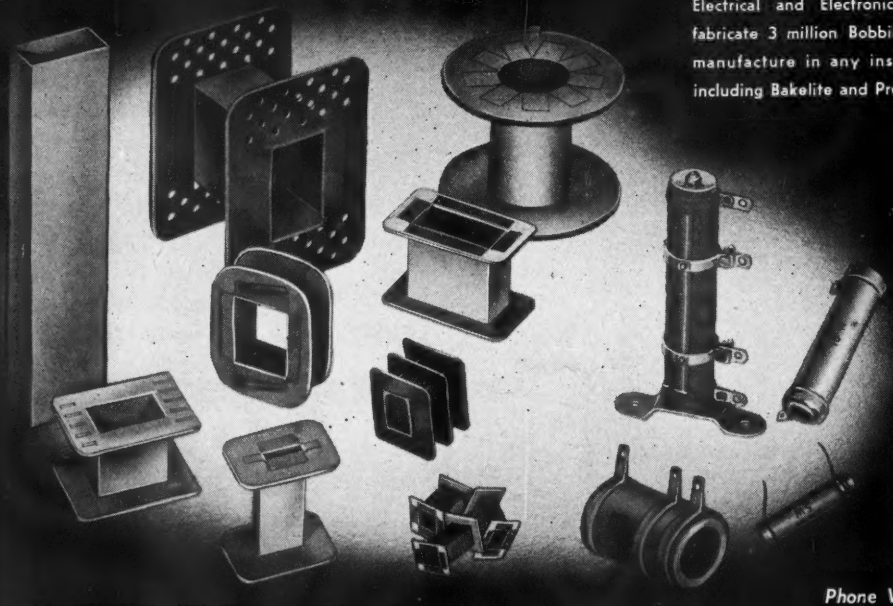

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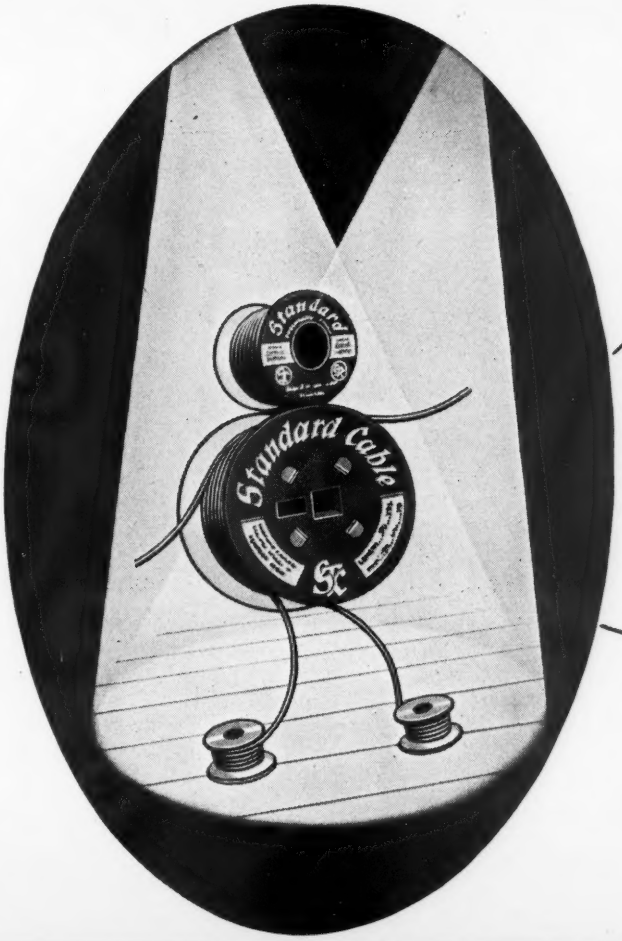

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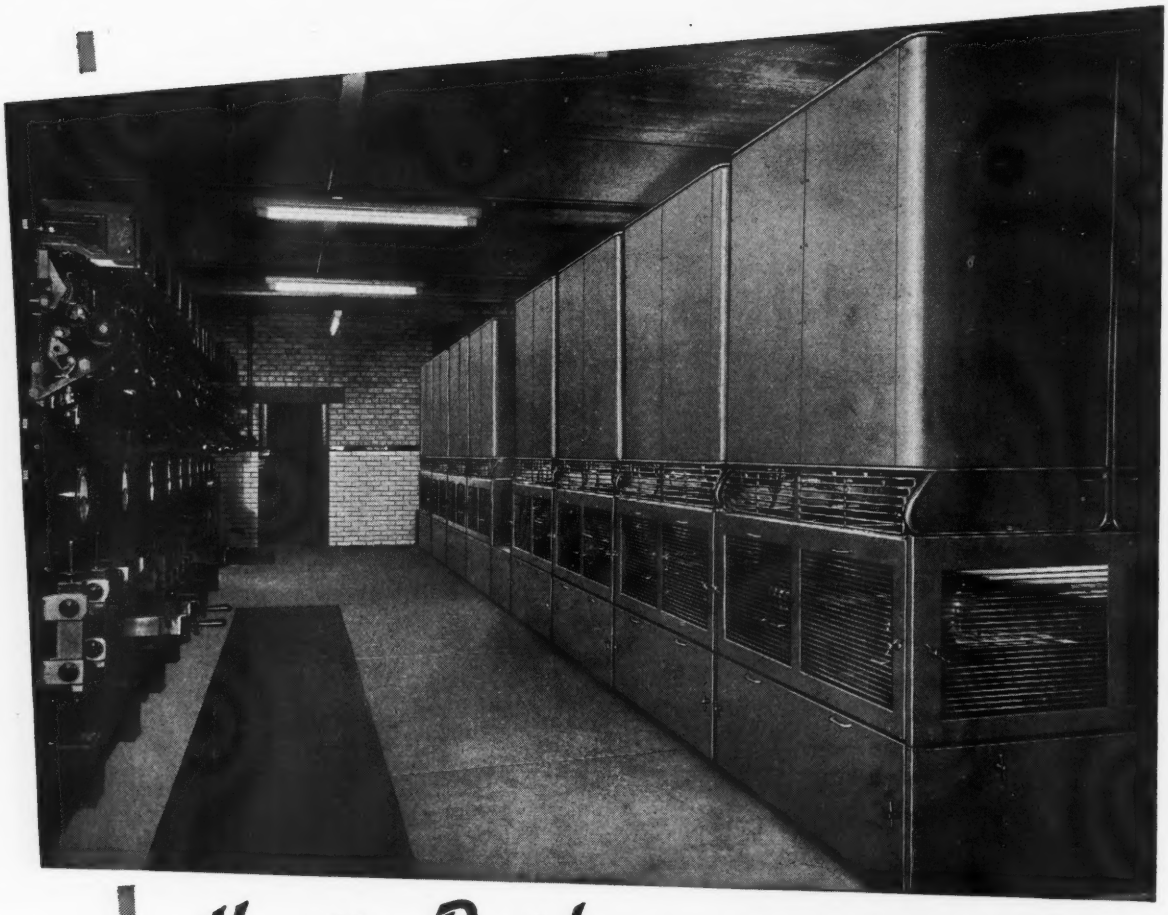

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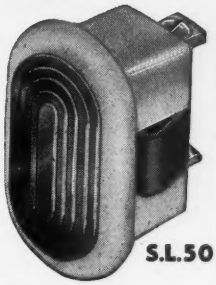

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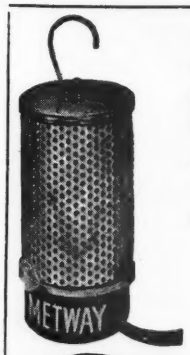

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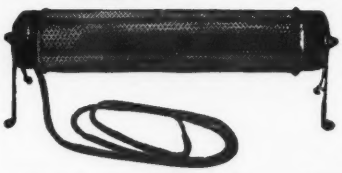

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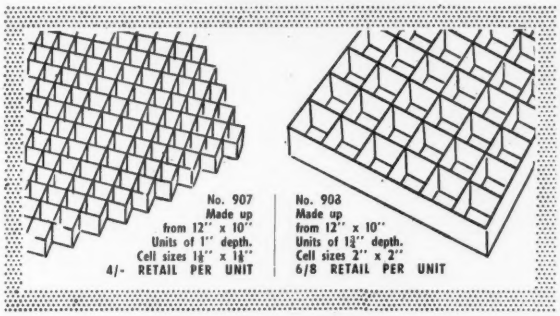

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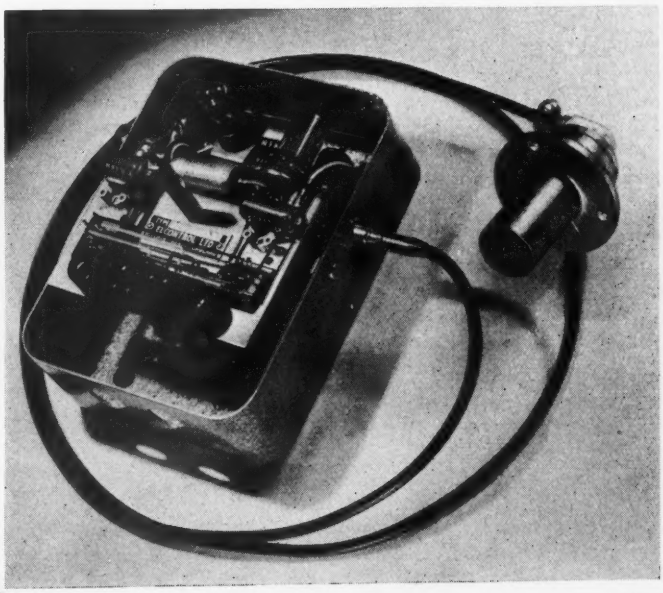

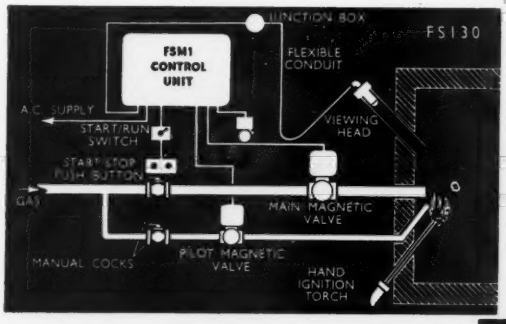

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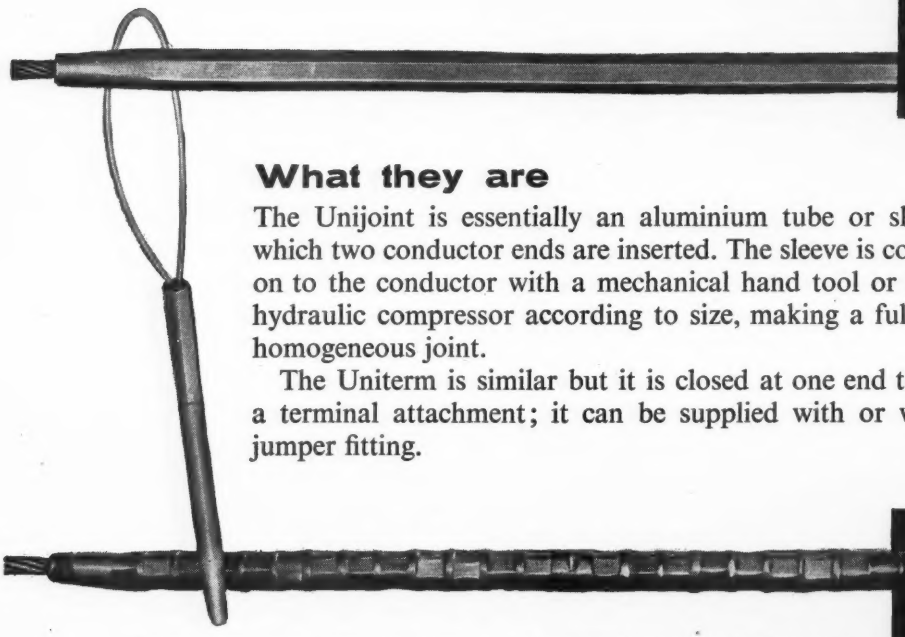
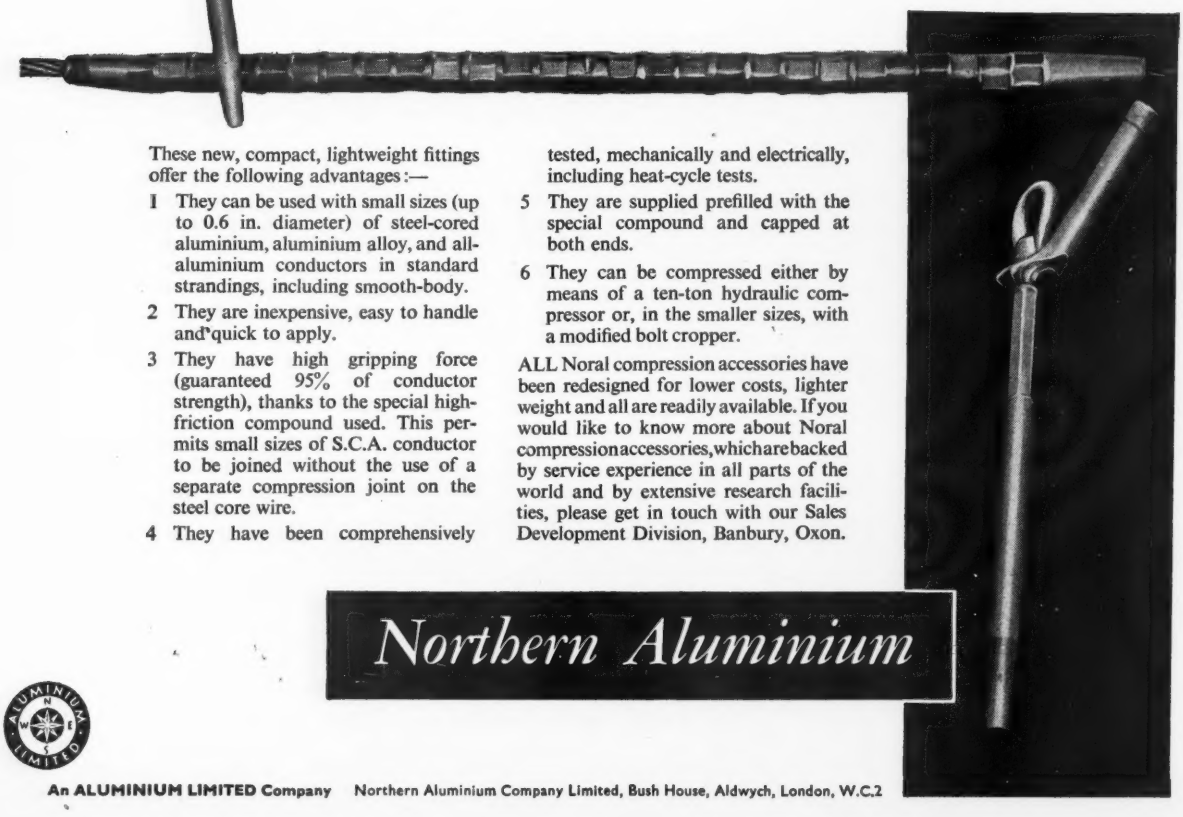


What they are

The Unijoint is essentially an aluminium tube or sleeve into which two conductor ends are inserted. The sleeve is compressed on to the conductor with a mechanical hand tool or a ten-ton hydraulic compressor according to size, making a full-strength homogeneous joint.

The Uniterm is similar but it is closed at one end to provide a terminal attachment; it can be supplied with or without a jumper fitting.



These new, compact, lightweight fittings offer the following advantages:—

1 They can be used with small sizes (up to 0.6 in. diameter) of steel-cored aluminium, aluminium alloy, and all-aluminium conductors in standard strandings, including smooth-body.

2 They are inexpensive, easy to handle and quick to apply.

3 They have high gripping force (guaranteed 95% of conductor strength), thanks to the special high-friction compound used. This permits small sizes of S.C.A. conductor to be joined without the use of a separate compression joint on the steel core wire.

4 They have been comprehensively tested, mechanically and electrically, including heat-cycle tests.

5 They are supplied prefilled with the special compound and capped at both ends.

6 They can be compressed either by means of a ten-ton hydraulic compressor or, in the smaller sizes, with a modified bolt cropper.

ALL Noral compression accessories have been redesigned for lower costs, lighter weight and all are readily available. If you would like to know more about Noral compression accessories, which are backed by service experience in all parts of the world and by extensive research facilities, please get in touch with our Sales Development Division, Banbury, Oxon.

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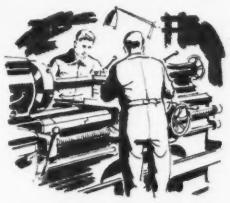
Electric Actuator
5,000 lbs. thrust
7 inch stroke
1 inch per second



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Both the "C" and "R" Series can be operated by the lock unit illustrated.

The lock barrel can accommodate panels up to ½" thick, and the key can be made to withdraw or not in a number of positions.

This method of control is of great value to plant engineers and manufacturers of equipment requiring operation by limited personnel.

Special Locks providing even greater secrecy can be supplied, as used by Atomic Energy Establishments.

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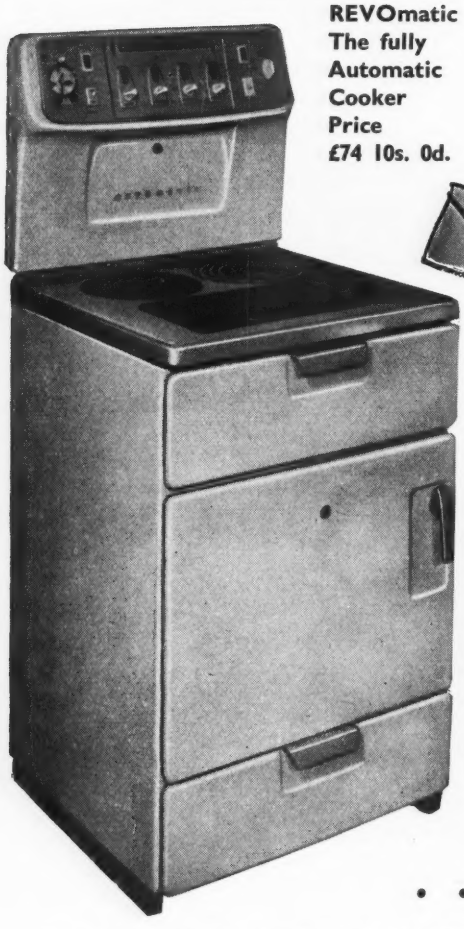

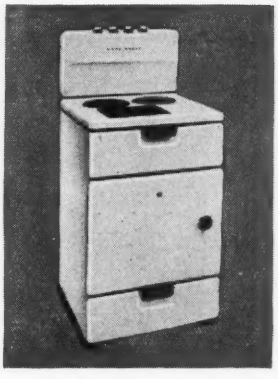

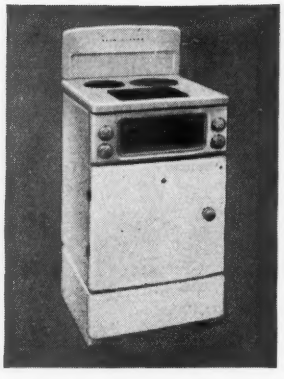

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To a home of *luxury*, the Revomatic adds *liberty*, releasing the housewife from hours of tedious attendance in the kitchen.
Meals are prepared as far in advance as necessary; a simple control is set to begin cooking at the desired hour; the complete meal is ready to serve exactly when required! During the whole time the housewife is free to come and go as she pleases. The Revomatic is a masterpiece among cookers. The following are but a few of its outstanding features.

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- ★ **APPLIANCE PLUG (for kettle or iron)**
- ★ **FLOODLIT HOB & OVEN (lights up your cooking)**
- ★ **16 GAY COLOUR COMBINATIONS**

(Above left) **REGAL COOKER**
Exceptional, large easy-to-clean oven; ample hob space; convenient eye-level switches; large grill-boiler; two 8″ boiling plates. From — £39 0s. 0d.

(Above right) **REGENT COOKER**
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'WESTMINSTER' PATENT VACUUM TUBE DETECTORS

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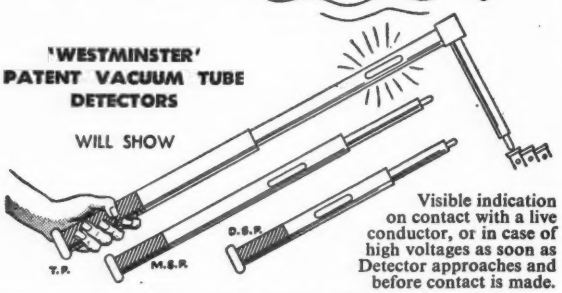

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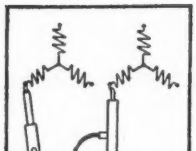

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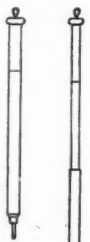

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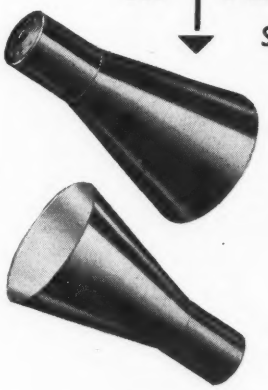

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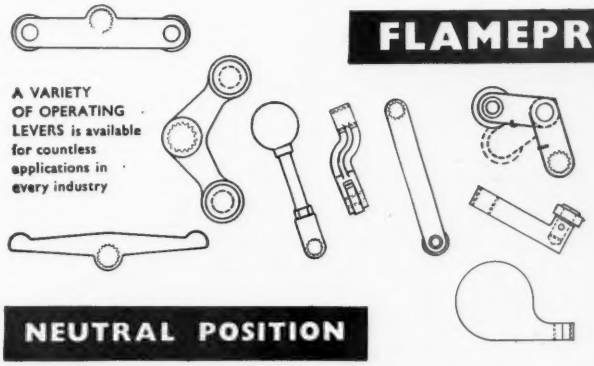

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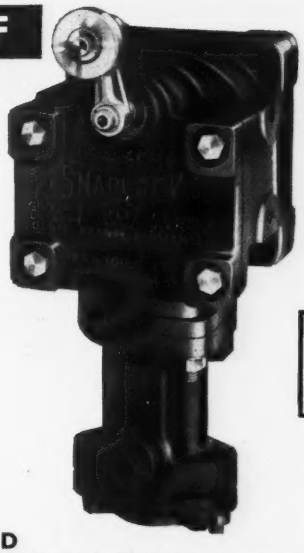

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These limit switches are now available in Neutral Position versions. Spring-loaded devices return the operating lever to the central (neutral) position. One or both of the springs are removable for various circuit arrangements. A third spring is supplied for converting to one normally made and one normally broken circuit.

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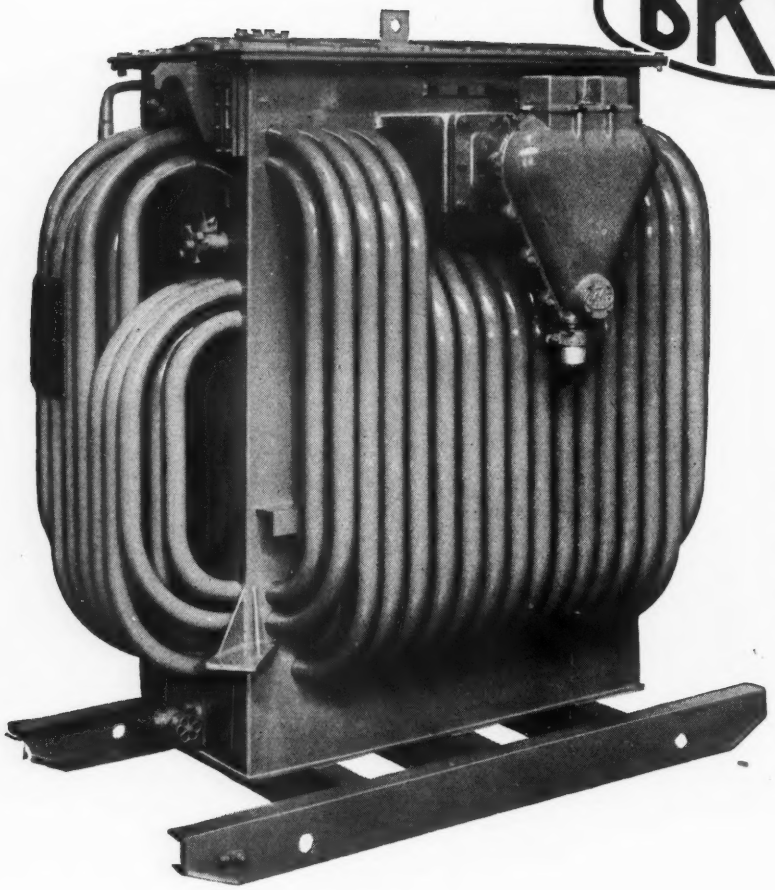
T 1 SPECIFICATION

A complete range of

Substation Transformers

to C.E.A. Specification T 1 by

BRYCE



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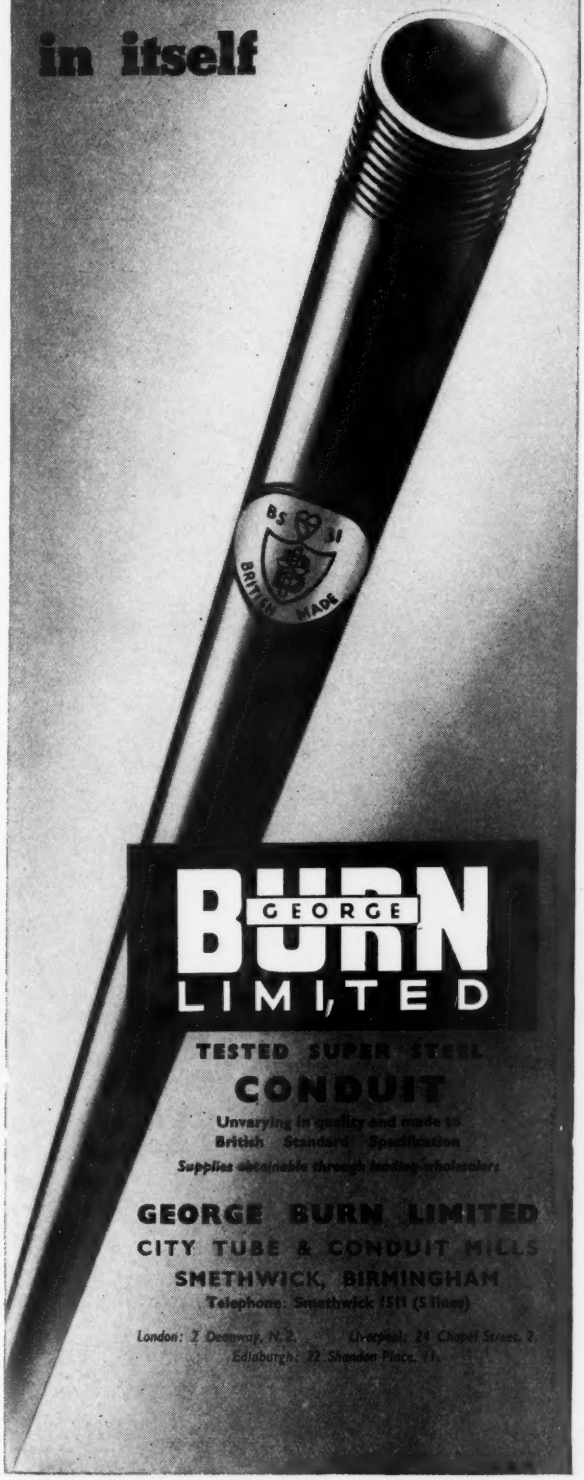

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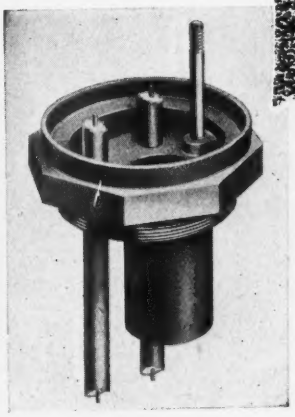

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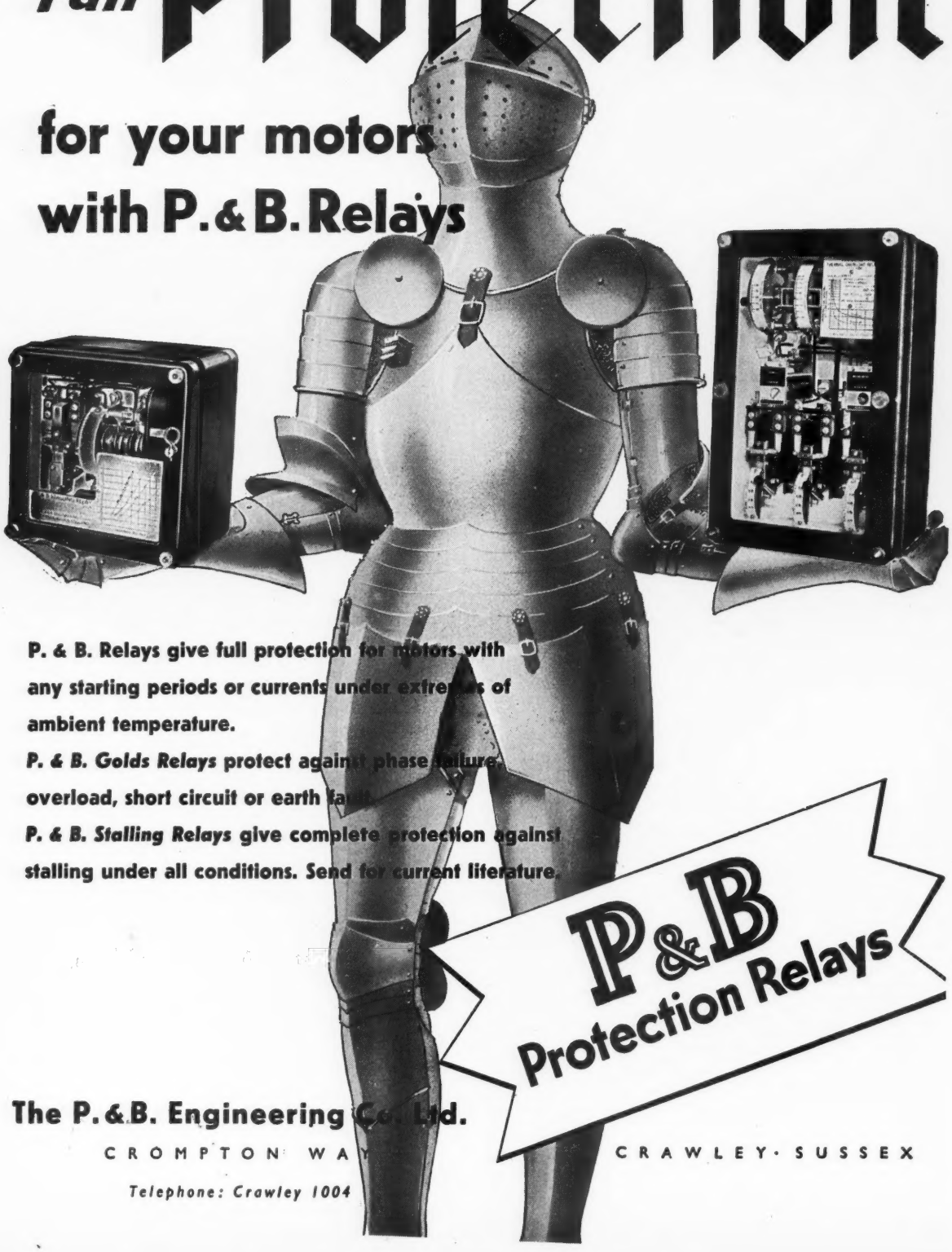

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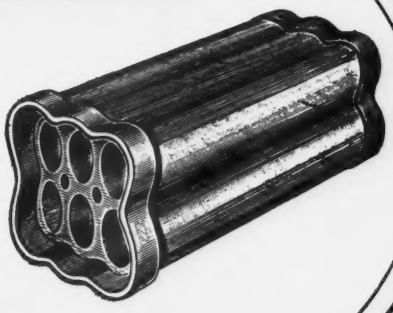

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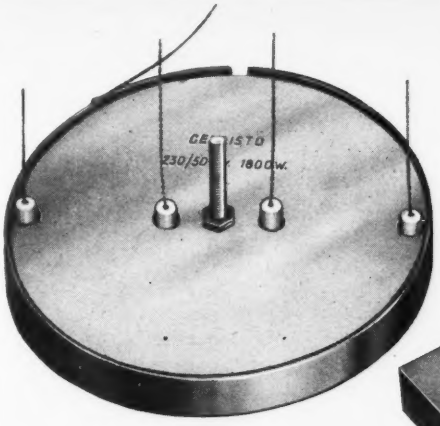

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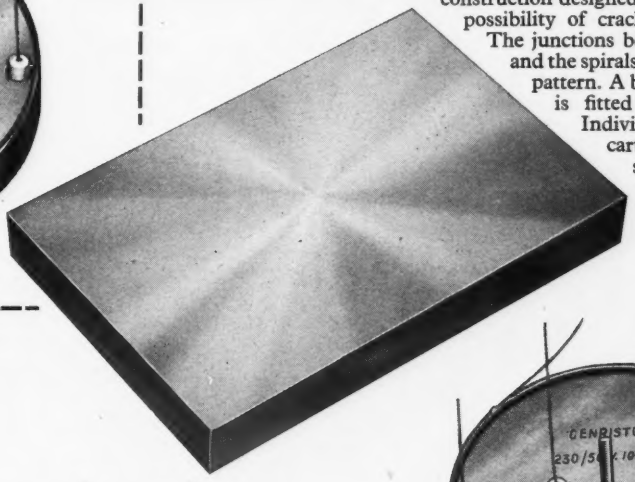

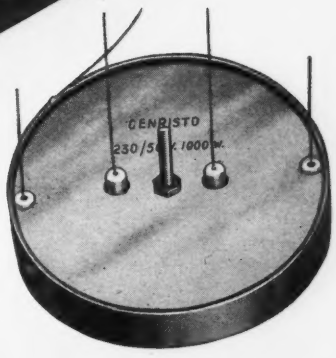

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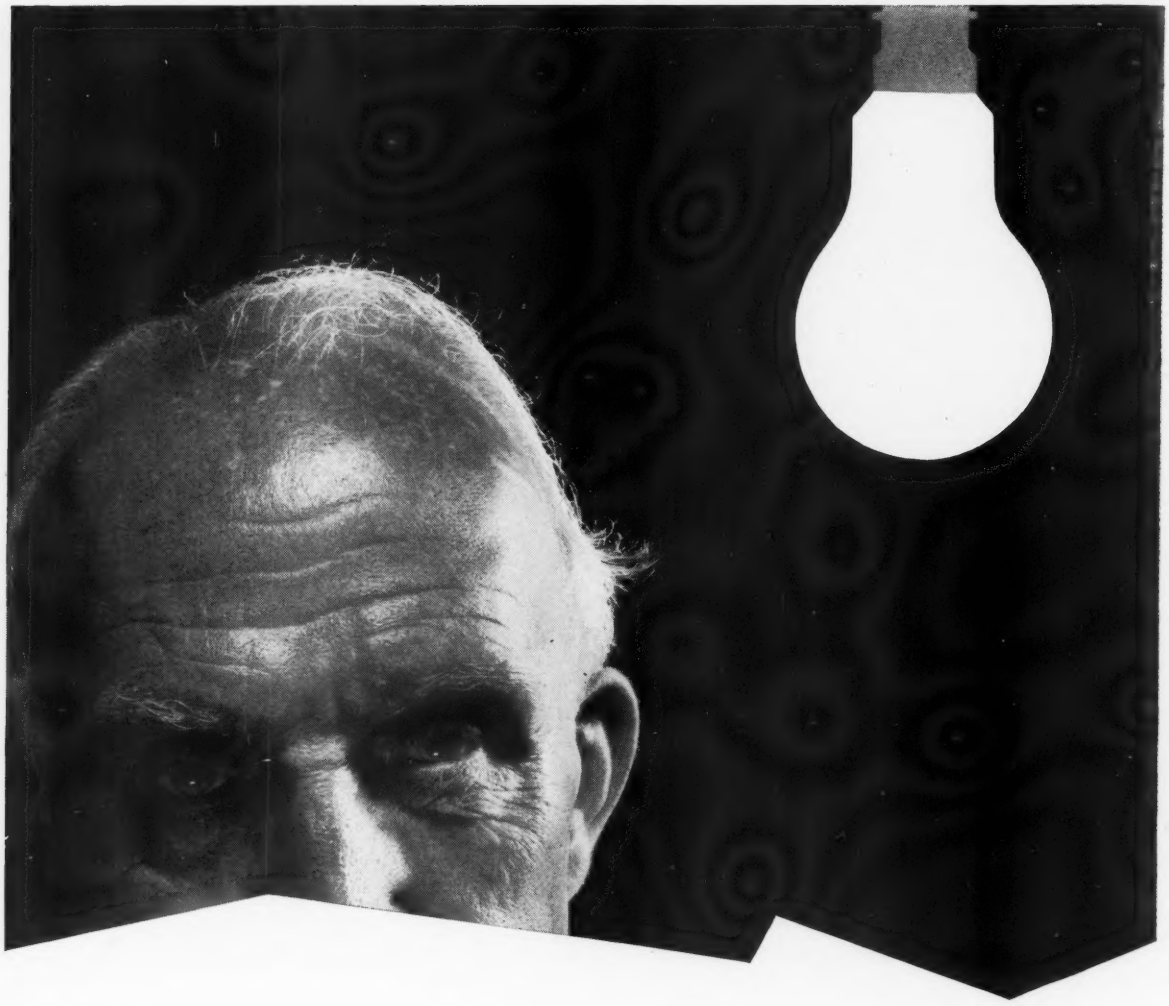

these eyes have seen a revolution

Around the time when Grandad's eyes first saw the light of day, two inventors, Edison and Swan, were getting excited about another kind of light, conjured up by passing an electric current through a carbon filament in a vacuum. Only a reddish glow, but it brought the two men together in an enterprise which has made life fuller and safer for everybody. The amazing efficiency of the modern electric lamp was developed largely in the Siemens and Ediswan factories, now an important part of the new Siemens Edison Swan Company. These simple facts are worth remembering; they offer you a reliable way of recognising a good electric lamp, radio valve or TV tube when the need arises.

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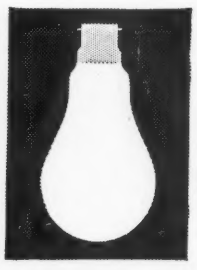

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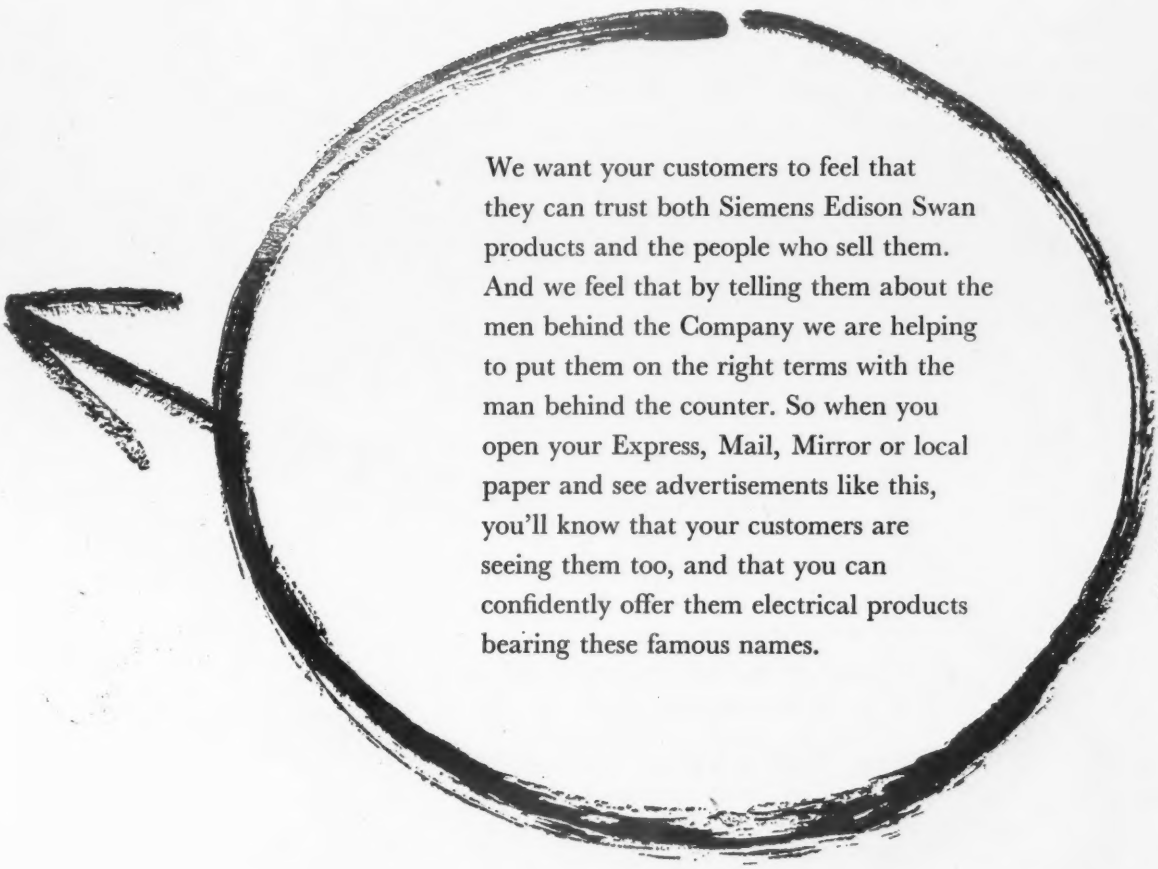

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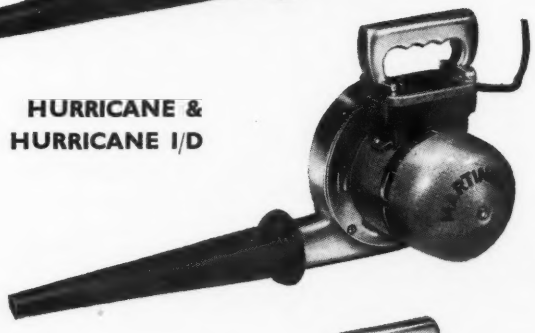

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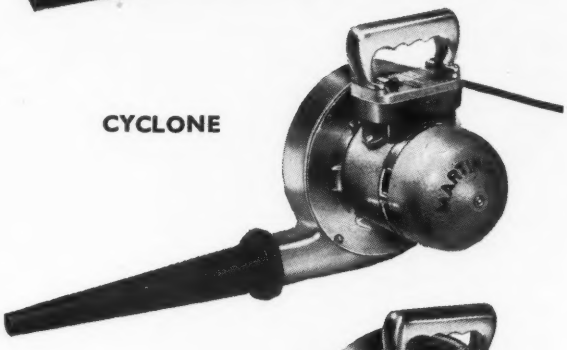

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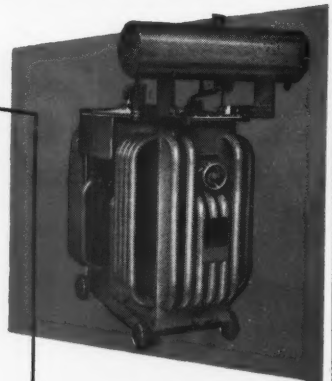

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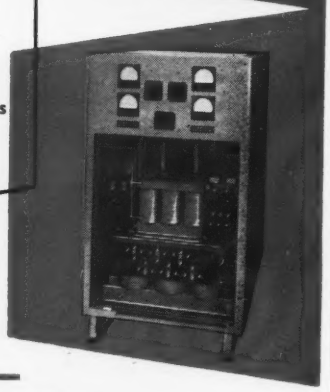

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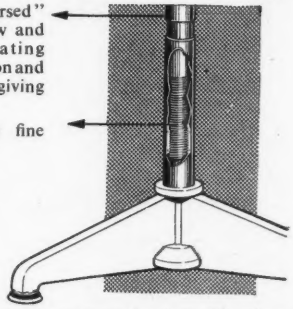

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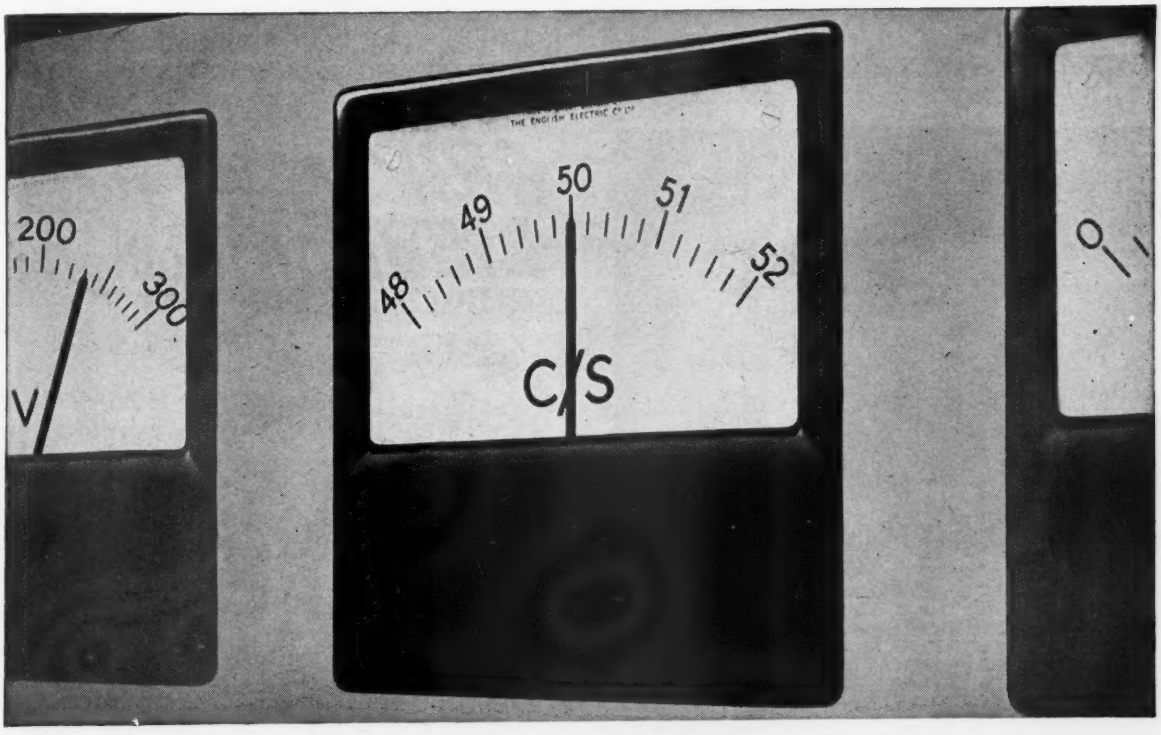

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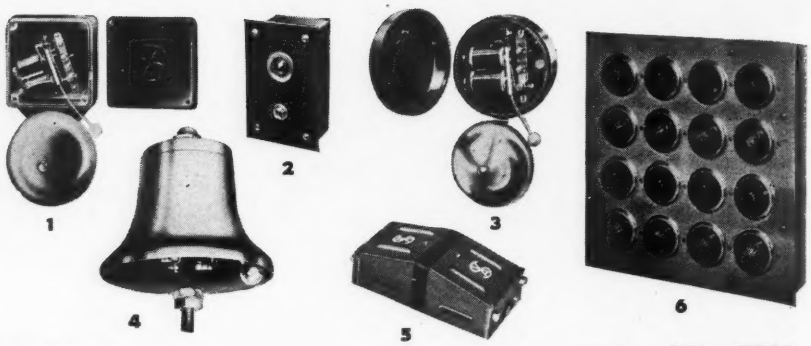

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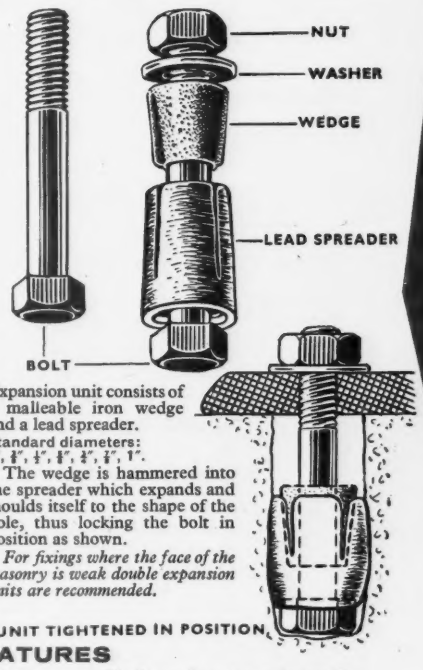
It is recommended that, where the face of the masonry is weak, additional collars be used.

UNIT TIGHTENED IN POSITION



Expansion unit consists of a malleable iron wedge and a lead spreader.

Standard diameters: ½", ⅝", ¾", ⅞", 1", 1¼", 1½", 1¾", 2".

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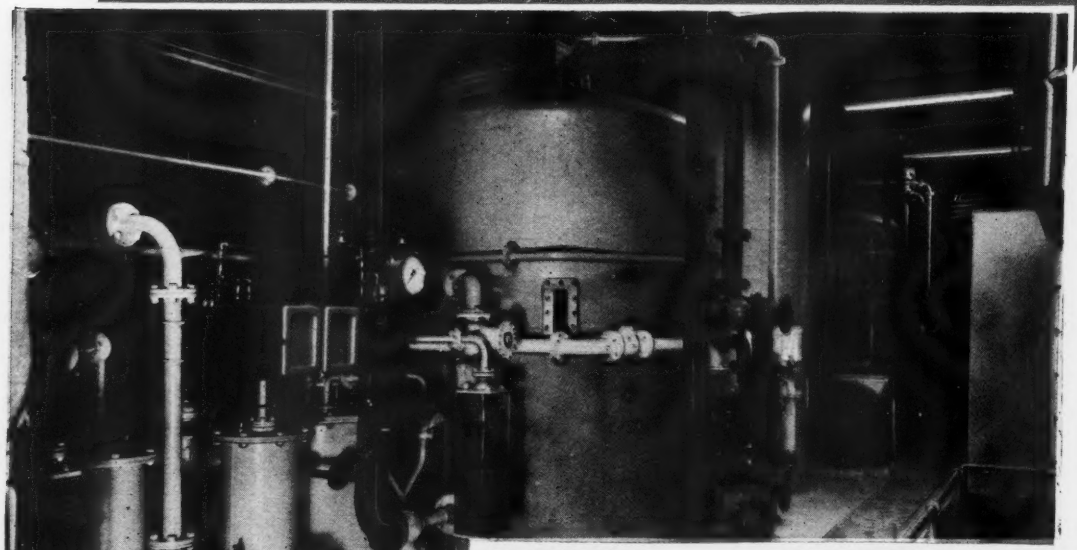
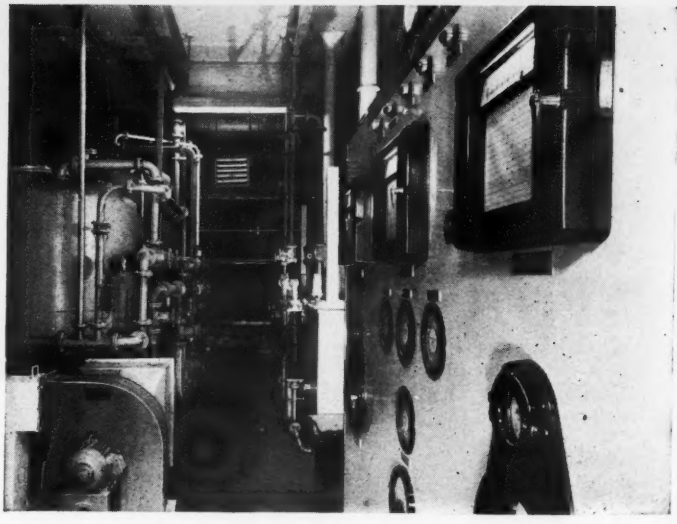
WATER TREATMENT BY DE-IONISATION





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TOTAL DISSOLVED SOLIDS	RANGING FROM 587—638 p.p.m.	IMMEASURABLE
ELECTRICAL CONDUCTIVITY	660	0·1—0·2

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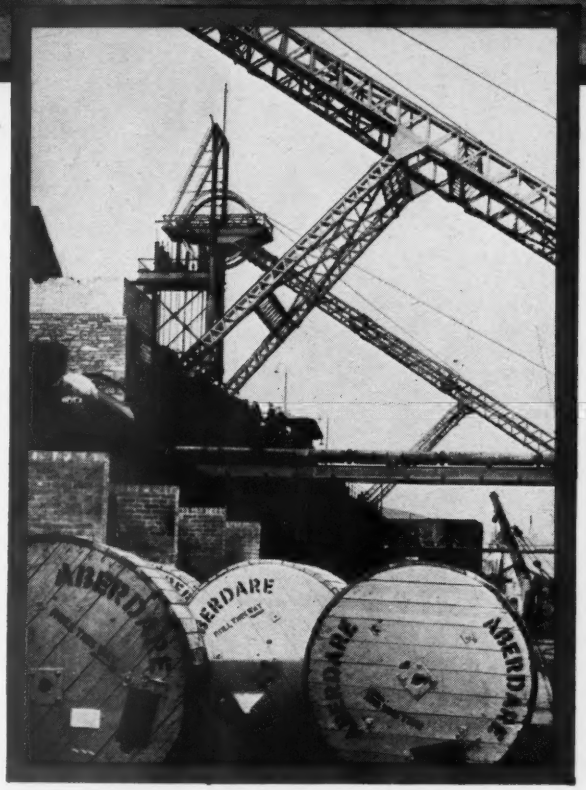

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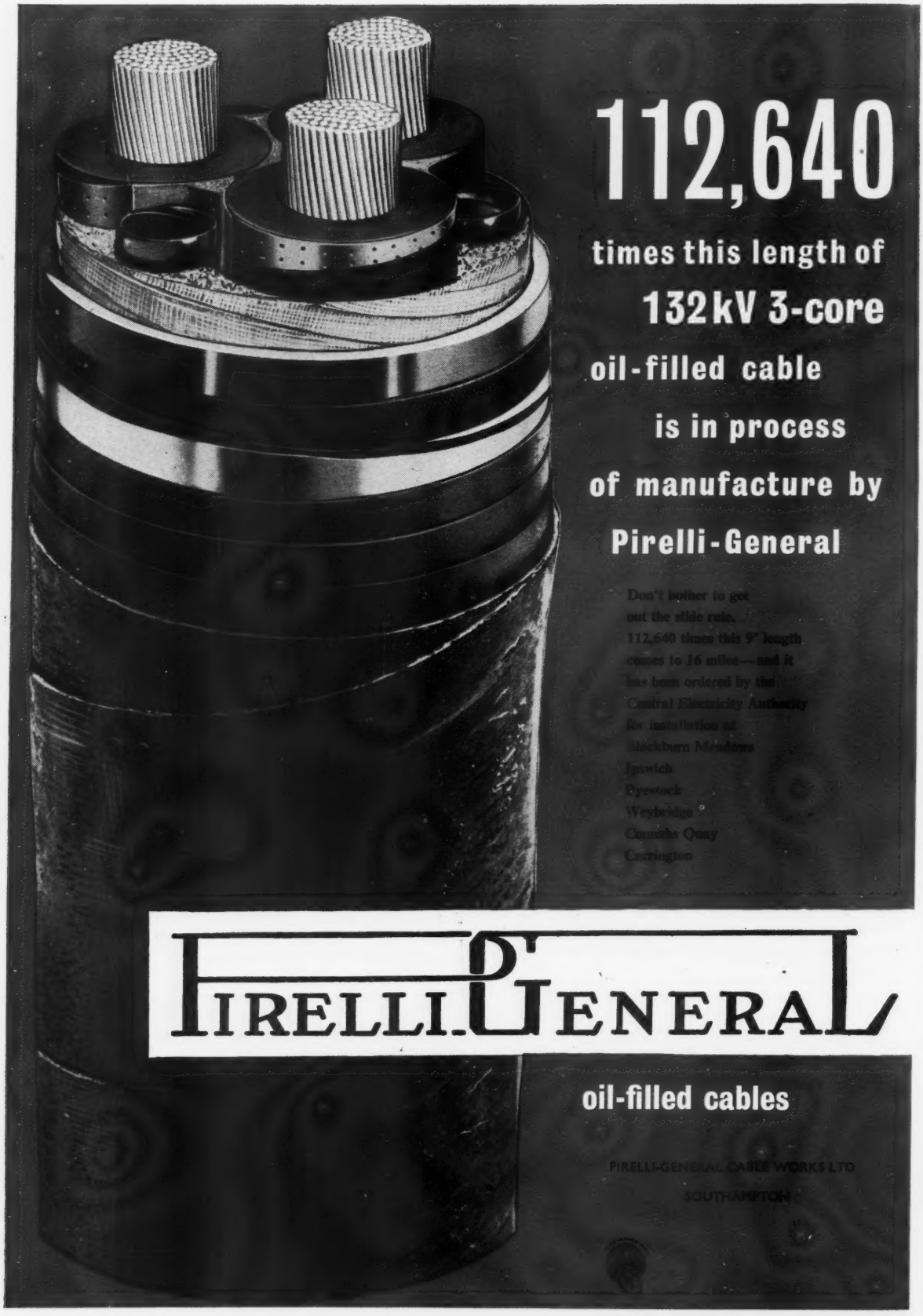
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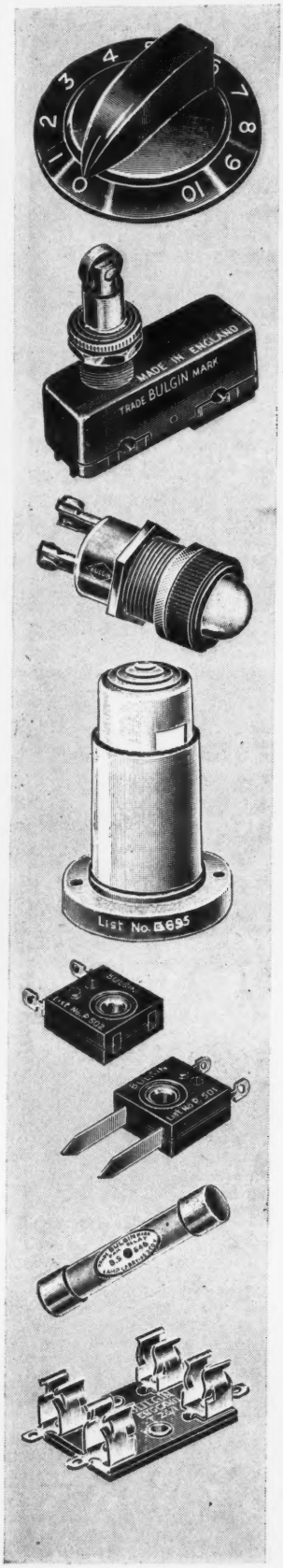

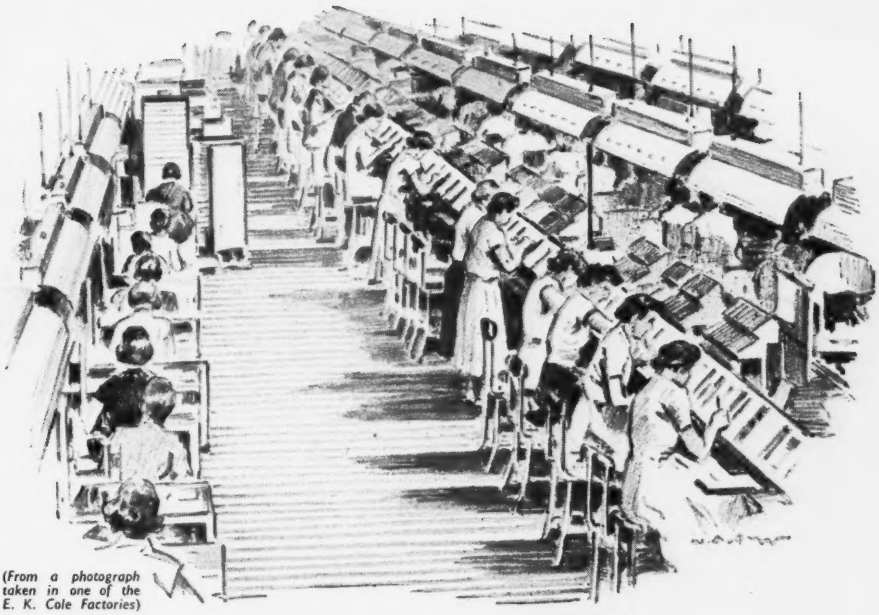

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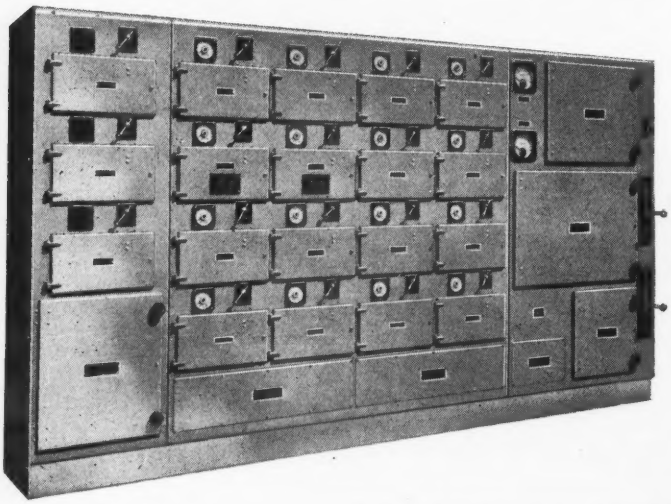
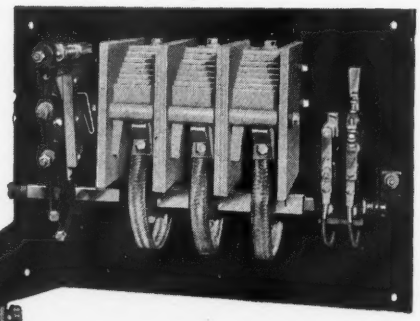


On the left is illustrated a typical Multi-Motor Switchboard with busbar-fed individually isolated starter cubicles



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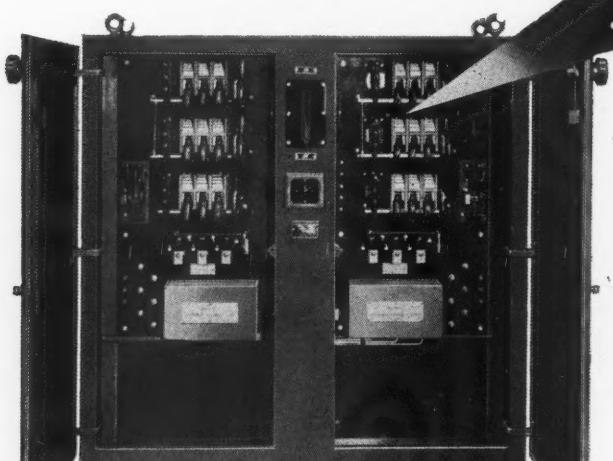

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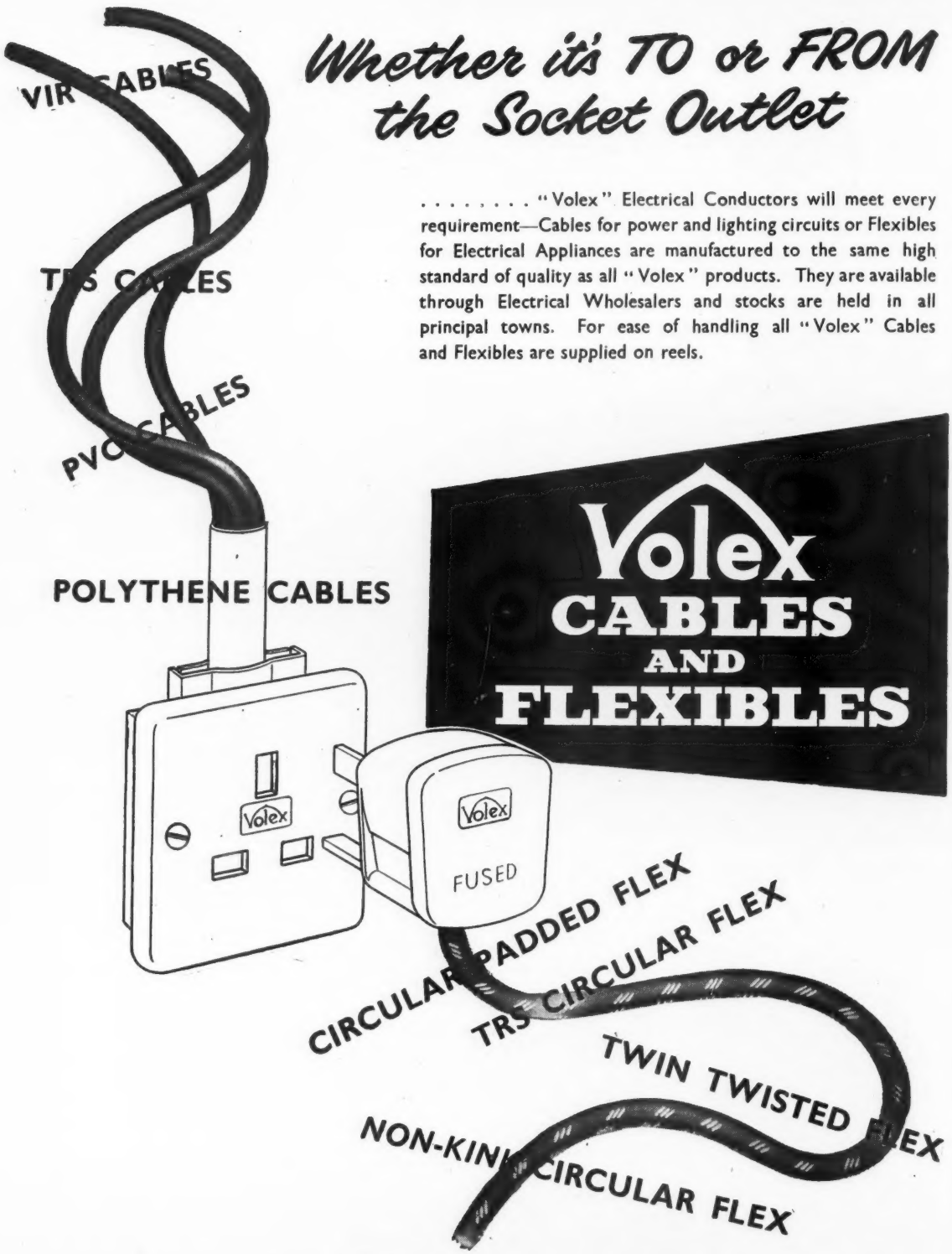

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Output kW	*Pass out lb. hr.*	*Pressure*
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1,800	40,000	110
1,800	40,000	110 and 40

Double Pass out at 1,000 kW fully condensing. Speed 1,000 r.p.m. through Reduction Gear.

2,000 kW (2,350 kVA) Condensing Turbo Alternator Set by BELLISS & MORCOM/L.D.M., for 6,600/3/50, Steam pressure 180/250 lb.sq.in. Overload 25% for two hours. Surface Condenser mounted below Turbine.

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Two Diesel driven Alternator Sets by CROSSLEY/B.T.H. Engine 330 b.h.p., type XVD6, 6 cyl., 4 stroke, 600 r.p.m. Direct coupled Alternator 420/3/50, 4 wire.

160 kW (200 kVA) Diesel driven Alternator Set by BLACKSTONE/E.E.C. Engine type E.P.V.6, vert., 6 cyl., 240 h.p., Direct coupled Alternator 400/3/50, 0·8 p.f. with flange mounted Exciter. Speed 600 r.p.m.

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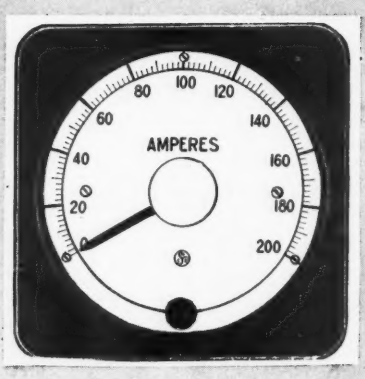

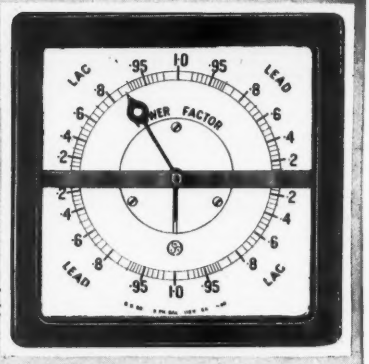

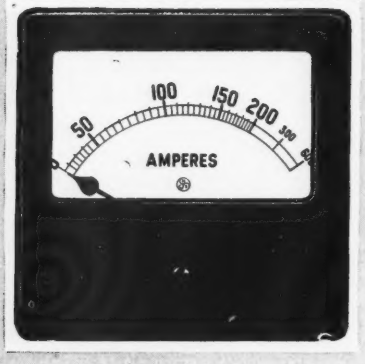

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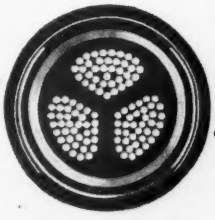

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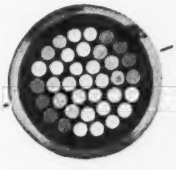

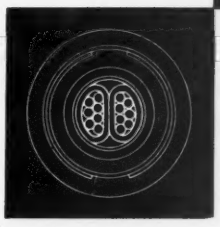

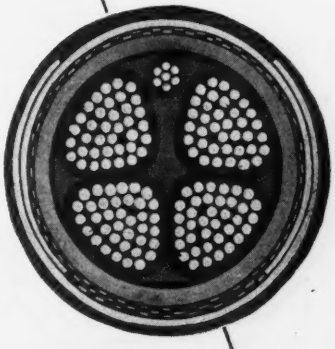

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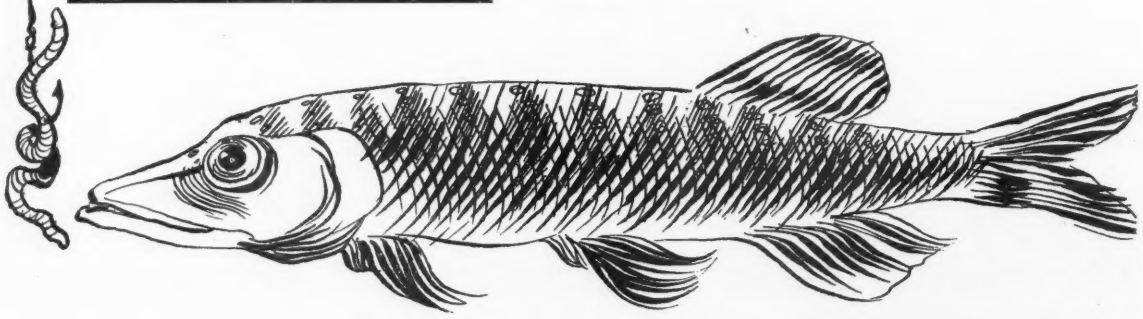

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18 OCTOBER
1957

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

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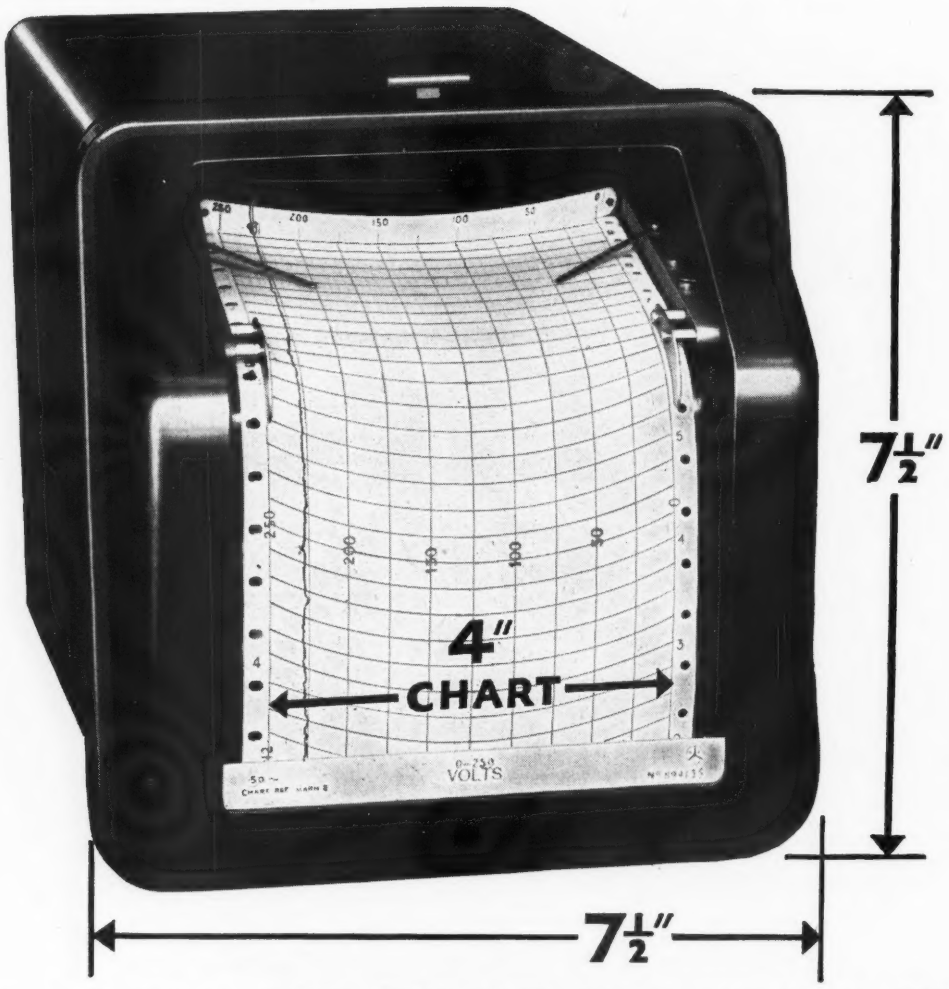

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ELECTRICAL REVIEW

18 October 1957 Vol. 161 No. 16 Established 1872

European Free Trade

ALTHOUGH in the early stages of the plan it was the Government's view that the establishment of a European Free Trade Area was desirable and it was felt that the United Kingdom could not afford to remain outside it, further consideration of the possible effects on our economy has engendered some hesitation. At the outset the British Government expressed the wish that foodstuffs should be excluded from the scope of the discussions because other Commonwealth countries would be adversely affected, and now some other industries, for other reasons, would like to be excepted.

Before the Government issued the White Paper on the subject (Cmnd. 72) the Federation of British Industries had asked its 287 member associations for their views. None accepted the idea without qualification, but only about 20 of those who felt able to voice their members' opinions were unconditionally opposed to negotiations. About 80 others considered that there should be safeguards against unfair competition. A much greater proportion of individual firms approached were in favour of negotiations, again with safeguards.

The electrical industry's views were set out in a memorandum prepared by the British Electrical and Allied Manufacturers' Association. In this it was contended that any increase in British electrical exports to Europe (expected to be small) as a result of European Free Trade would be insufficient to offset probable losses in the home market. At present the balance of trade with Europe was very much in our favour, but as, on the whole, our tariffs were rather higher than those we encountered in Europe it would be easier for Continental manufacturers to increase their exports to this country than it would for us to increase our exports to Europe. Apprehension was expressed about the possibilities of unfair competition and undesirable developments in other directions. It was thus made clear that although, through their Association, British electrical manufacturers were not against the general idea of European Free Trade, they were not prepared to back any scheme unless many dangerous possibilities were guarded against.

That is what we meant when we said in last week's issue that there was a great deal of ground-clearing to be done before the Government could approve and enter into any plan. We also thought, on the other hand, that too many safeguards might render the plan ineffective. But it is fair to record that at the Electrical Industries Club last week Sir Hugh Beaver, president of the F.B.I., said that he did not believe

that any clauses designed to save any major British industry would " drive a coach and four through the whole idea." Sir Hugh thought that we were not yet ready to sacrifice our right to be the final arbiters of our fate.

The United Kingdom is now committed to discussions if not to eventual acceptance of the Free Trade Plan. To give our readers some understanding of the proposals and the way in which the British electrical industry fits into the picture we publish in this issue the first of three articles by an economist who is with one of the leading electrical groups.

NUCLEAR PLANT MANUFACTURE

The first article in this issue shows that although both the steam and electrical generating conditions in a nuclear power station differ from that in a modern thermal station, it is in the works of the boiler and vessel manufacturer where the most adaptation is necessary to meet the progressive change-over from thermal to nuclear power station construction. Whereas intricate problems arise in general station design and in the design of reactor cores and shielding, these are met by smaller scale adaptation of manufacturing facilities than is required to produce the requisite reactor and heat exchanger vessels and attendant parts. This necessary adaptation and extension of facilities in the boiler and vessel manufacturers' works is largely a matter of scale, together with the development of machines and methods to meet problems of fabricating and welding suitable types and thicknesses of steel.

Problems also extend beyond the manufacturers' works to the station site, where Class 1 vessels too large for transportation must be built up from sections fabricated in the works. Furthermore, work on site must be as good as the best works practice. The company concerned in our article has integrated its nuclear work with other manufacturing activities. This, no doubt, facilitates full economic operation of certain heavy and specialised equipment and, at the same time, ensures the maintenance of high standards of quality in the manufacture of conventional products.

ELECTRICITY AND DISTANCE

During the past several days two important world wide developments have taken place, each closely relating electrical applications and long distances. One of these developments was the artificial earth satellite launched by Russia. At a Press conference called by the Royal Society we learned a good deal about this satellite: it was moving in a nearly circular orbit about 500 miles above the earth's surface at about 16,700 m.p.h.; it had been propelled into the orbit by a three-stage rocket; the skin temperature of the satellite was likely to lie between ± 100 deg C, and so on. No electrical information relating to the satellite was available, however; yet we feel, in our ignorance, that electric and electronic instrumentation of a very high order must be employed and that this, together with the radio communication to the earth, must mark this outstanding feat as very much an electrical one.

The other development was the long cable telephone call which was made from Washington to Honolulu, via New York, London, New York, Seattle, Alaska, Seattle and San Francisco—a total route distance of 16,850 miles. The " return trips " between New York and London and between Seattle and Alaska were made purely for demonstration purposes. All the same the whole was a remarkable achievement proving in a striking way what can be done in the telecommunication field over very long distances by linking together land and submarine cables.

THE WINDSCALE INCIDENT

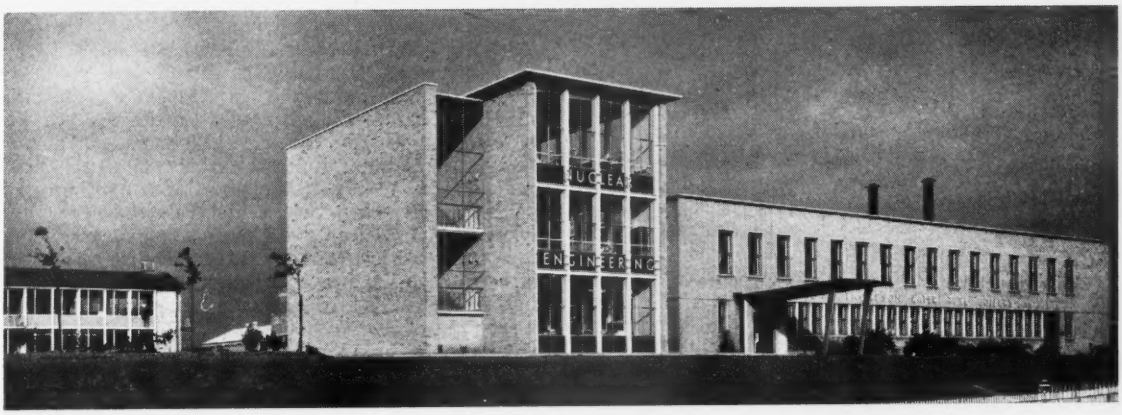
As reported elsewhere in this issue the overheating of some of the fuel cartridges in one of the piles at the Windscale plutonium extraction plant last week necessitated the shutting down of that part of the works and the institution of special safety precautions to guard against contamination by a small amount of oxidised uranium which managed to escape.

In its statement on the incident the United Kingdom Atomic Energy Authority stressed the fact that such an accident could occur only in an air-cooled open circuit pile. The construction and operation of the Calder Hall type of reactor are such that it is immune from any occurrence of this kind. It is very necessary that this assurance should receive the widest publicity not only at home but also overseas where several countries are contemplating the installation of Calder Hall type reactors.

INTERNATIONAL CONTRACT CONDITIONS

Electrical manufacturers are used to different foreign purchasers stipulating contract conditions that vary widely both in form and content, and much time and effort can be spent in finding a basis for agreement. The sets of standard conditions drawn up over the past six years by a working party of the Economic Commission for Europe (see page 700) are therefore most welcome. Even where these conditions are not acceptable to the purchaser as they stand they do, for the first time, offer a satisfactory basis for a fair compromise. In fact they should come to have a significance in the international field comparable with that of the admirable set of model conditions which have been evolved by the Institutions of Mechanical and Electrical Engineers in this country.

That four complete sets of conditions have been agreed, and not merely a few " optional clauses " covering the more acute problems that beset international contract conditions in engineering, is in large measure due to the lead taken by the British delegation in the proceedings of the working party. They were able, for example, to provide the precedent, unknown on the Continent, of the I.Mech.E.-I.E.E. conditions. Again, since they did not, like most delegations, include direct representatives of purchasing or manufacturing organisations, they were able to develop a professional as distinct from a purely commercial approach in circles where such an approach was hitherto unknown. In this the British delegation was particularly fortunate as representing within itself an example of that friendly co-operation between our electrical manufacturers and their principal home customer that in recent years has been so beneficial to the British electrical industry.



The new John Thompson nuclear engineering development department at Wolverhampton

NUCLEAR POWER PLANT MANUFACTURE

Extension and Adaptation of John Thompson Works

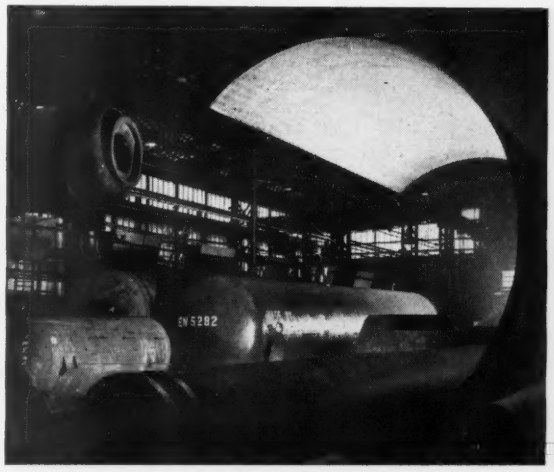
IN the manufacture of heavy plant for the commercial gas-cooled nuclear power station, the portion which varies most widely and substantially from established practice and requires most adaptation and extension of manufacturing facilities is that which is carried out by the "boiler-making and vessel-making" partner of the power station building team. When we visited the Wolverhampton works of the John Thompson group of companies last week we were able to see something of the degree of adaptation and extension undertaken to meet the nuclear power programme. In this case, the boiler-making partner of a nuclear power consortium (A.E.I.-John Thompson Nuclear Energy Co., Ltd.) is producing for the commercial nuclear station the reactor vessels and the complete heat exchangers, together with gas ducting and thermal shielding. In addition, this company is manufacturing the fuel loading and discharge machines, using special facilities developed by one of its group companies in precision engineering work for Admiralty contracts. The way in which the necessary adaptation and extension of facilities has been carried out is of particular interest, because of its integration with rapidly expanding output in other fields of manufacture.

The value of output of the John Thompson Group, in 1956, was more than double that for 1952 and more than three-and-a-half times that for 1949. From 1949 to 1953, output increased yearly by almost equal steps, then went ahead by greater bounds in 1954, 1955 and 1956. While this output included some work for nuclear projects (in particular, for the Dounreay fast reactor in 1956), the major part of it has been due to increase of the group's more conventional manufacture of power station and industrial boilers, process plant and other products.

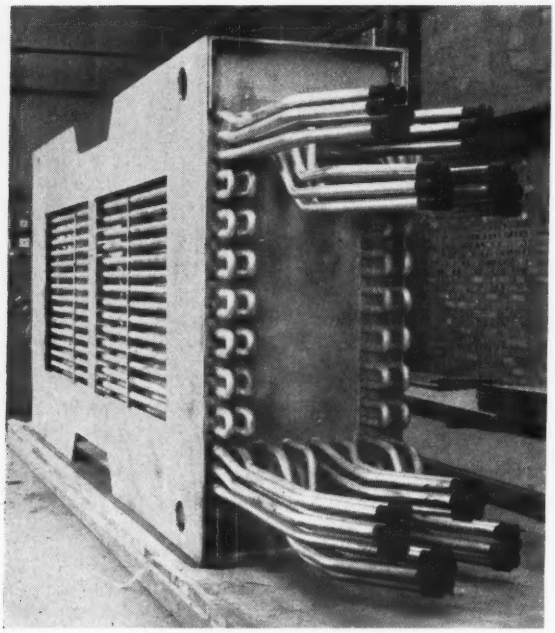
The extensions which we saw cater for increased output all round, while, overlaid on this, are the necessary adaptation and extension of facilities for nuclear power plant manufacture. At certain points in the works, as, for instance, in the heavy plate bending and welding shops, one sees mixed products such as rotary cement kiln bodies and boiler shells interspersed in production with nuclear power boilers (heat exchangers); each of these products afterwards passes to specialist shops which are employed full time in completing the fabrication of a particular type of unit.

The manufacturing resources now available at John Thompson's works are sufficient to undertake commencement of work for one commercial nuclear power station of the Berkeley type, or of larger output, per year. Considered alongside the Government's nuclear programme of 6,000 MW by 1965, and estimating the possible share of each of the manufacturing consortia in this programme, it is clear that the company's production capacity can cater for some overseas contracts for nuclear plant in the same period. This work need not necessarily be for complete heat exchangers and reactor vessels as at Berkeley. For some parts of the plant, manufacturing facilities closer to site might be employed.

The various John Thompson works at Wolverhampton



This roll forming machine in the electric welding shop is used in the manufacture of heat exchanger and reactor vessels



Example of a plain tube pack for the Berkeley nuclear power station heat exchangers

are grouped together in a land area of sixty-five acres, and the necessary extensions to many of them have been facilitated by there being ground available adjoining the particular shops requiring extension. In some instances, land adjoining the works area had to be acquired; and in one case, a group company—John Thompson Ordnance Co.—has been removed to new premises in order to vacate its existing shops for other purposes. This removal served a double cause; it provided a large shop, immediately adjacent to the heavy bending and welding department, for the further processing of large heat exchanger shells passed from that department, and at the same time it allowed replanning of the ordnance shops and design offices to meet the company's new role in manufacturing for nuclear stations.

Simultaneous with works expansion, there have been extensions to related design and drawing offices. These include new offices for John Thompson (Wolverhampton), Ltd., concerned with vessel and shell boiler design, and a new building housing the nuclear engineering development department. The latter works in close collaboration with the A.E.I.-John Thompson Nuclear Energy Co. in design for commercial nuclear power stations, and in co-operation with the Atomic Energy Authority in the preparation of designs for manufacture of experimental station plant.

Centralised Research

Research facilities, which have been expanding rapidly within individual group companies, have now been centralised at the Group Research Laboratories, which occupy a new building laid out complete with experimental workshops to provide the best possible conditions and equipment, for investigation of problems connected with all the fields of activity of the group companies.

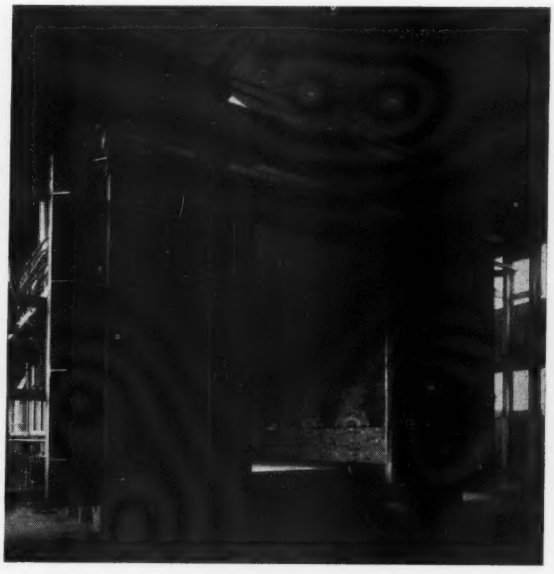
The heat exchanger vessels for Berkeley nuclear power station are now being manufactured and may be taken as an example of the use of the facilities now available. These vessels are 18ft in diameter, fabricated from steel plate 1⅛in thick. They are made up of five cylindrical sections forming the body of the vessel, and a domed section at top and bottom. The cylindrical sections are fitted with a large number of inlet sleeves for connection to pipework and tube headers. The domed end sections are fitted with 5ft diameter, 6in thick compensator rings to make up the necessary steel thickness and strength at the connection to gas ducting from and to the reactor vessel. Each of the seven sections is completed as far as possible in the works and afterwards transported to the Berkeley site for assembly and welding into a complete 70ft high heat exchanger. The whole of the welding must be to Class 1 requirements, and the fabrication must be stress-relieved after welding.

The cylindrical body sections of the vessels are each fabricated from two steel plates, roll-formed cold to shape in the large roll-bending machine in the heavy bending and welding shop. This machine serves the works with roll-formed shells up to 6in thick (thick plates are first heated in a furnace, alongside) for chemical and petroleum vessels, water-tube boiler drums, shell boilers, mill bodies, etc.

In the same 35,000 sq ft shop, the roll-formed plates are welded to form the cylindrical sections. Existing "Union-Melt" welding machines were able to make the necessary inner and outer welds for the seams, but to speed up operations and to relieve the machines for other work, an extension has been built to the shop. This houses a new high-lift boom "Union-Melt" machine, capable of both inner and outer fusion-welding runs on the seams of 18ft diameter shells.

To cater for further operations on these welded shells without hindering other production, the shop adjacent to the heavy bending and welding shop was vacated by the John Thompson Ordnance Co., as we have already mentioned. This 32,000 sq ft shop has been further extended by 7,000 sq ft which includes new bays containing an oil-fired annealing furnace with internal dimensions 45ft by 22ft by 22ft, and X-ray equipment. The X-ray equipment is in two chambers, each separated from the shop by lead-lined lifting doors with gantry-mounted 250 kV Newton Victor sets. Railed trolleys

The new annealing furnace adjacent to the heavy bending, welding and assembly shops



carry the large heat exchanger sections into the chambers, between which are a control room and a processing dark room, so that the whole forms a self-contained X-ray department serving this shop. Grinding of the welds preparatory to X-raying is carried out by a high-lift boom, fitted with a swing-action automatically-traversed Thompson grinding head.

Further operations to the cylindrical sections in this shop include flamecutting the ports and welding in sleeves for the pipework connections. The domed end sections, however, are completely fabricated in this shop. These are made up of petal plates pressed in the boiler press shop before being assembled and welded on specially constructed jigs.

Reactor Vessels

Construction of reactor vessels for the gas-cooled stations is largely site work, using pressed petal plates from the boiler press shop for the domed end sections, and roll-formed plates for the cylindrical sections. The Berkeley reactor vessels are made up of dome-shaped top and bottom sections and five bands of plates forming the cylindrical portion. Plate thickness is 3in and the vessel is 80ft high and 50ft in diameter.

Special pendulum flame planing equipment has been developed and installed for edge preparation of the petal plates, so that no machining is necessary.

Trial assembly of the reactor vessel plates is carried out before dispatch to site. In the case of the domed end sections, this is done on a large 50ft diameter jig in the newly-equipped fabricating shop, and for the cylindrical section, the bands of roll-formed plates are assembled on a circle of plinths in the works yard.

For the production of pipework and heat exchanger tubing, those resources are being used which are also employed for the fabrication of water-tube boilers and for conventional power station and process pipework. These resources have, however, been considerably extended. In particular, the tube work required for the nuclear power station heat exchanger is closely related to that carried out in the production of the *John Thompson-La Mont forced circulation boilers for land and marine purposes. The shops producing finned and plain tube packs for use in the heat exchangers have been increased by the addition of a new shop, alongside, with a floor area of 12,000 sq ft.

Part of the new factory of the John Thompson Ordnance Co., where the fuel feed and unloading machines for nuclear power stations are produced

The shops devoted to the fabrication of larger diameter pipework have been extended to cover an area of 63,000 sq ft. This includes a special section for stainless steel pipework; and here, the liquid-metal circuits, heat exchangers and boiler tubing for the Dounreay fast reactor have been produced. The shop is equipped with extensive X-ray plant, designed to gain access to difficult weld positions in banks of heat exchange pipework, and has process rooms forming a self-contained X-ray department. Nitrous oxide leak-detection equipment is also employed as a further check on absolute freedom from

The gear cutting shop in the new factory of the John Thompson Ordnance Co.

leaks. Argon-arc welding is used, producing a smooth inner bead, and as all joints are butt-welded, it is necessary to extrude nipples in pipes where branch connections are to be made.

Machining and fabrication to close limits are required in substantial quantity for many nuclear projects. This was especially so for the Dounreay fast reactor project, where tolerances required were very much stricter than in normal boiler-making practice. The precision machining is undertaken by the John Thompson Ordnance Co.

New premises for this company, with 49,000 sq ft of floor space, are now in full production. The company's established work has in the past been chiefly for Admiralty contracts in the production of gun directors, rocket launchers and similar mechanisms and precision fabrications. To execute this work and, in addition, carry out required work on nuclear projects, the company is equipped with machine tools built up from specially selected parts and operated well within load capacity, in order to maintain accuracy. In an enclosed gear-cutting shop, machines operate in a controlled atmosphere. A conditioned standards room is maintained and an area is set aside and equipped for collimation.

As mentioned earlier, all research facilities have been centralised. The purpose of the centre is not for fundamental research, but to investigate and provide answers to specific problems passed to it by group companies. The centre is composed of five departments under a director of research, the departments being concerned respectively with engineering, chemistry, combustion engineering, metallurgy and welding. There is also a technical library to provide reference books, maintain documentation from various sources and to operate a translation service.

Most of these research services are accommodated in a new building which was erected and occupied in mid-1956. This is of double- and single-storey construction, with large glazed areas, containing experimental workshops, drawing offices, and chemical and physics laboratories. Routine mechanical testing by the metallurgical department is carried out in a separately housed laboratory, as also is all X-ray work and photography, which includes considerable quantities of photomicrographs and photomacrographs. In this way the research staff are not burdened with routine testing work. The welding research department also has separate premises to cater for the substantial amount of experimental shop work entailed. Its premises contain a welding school.

Standard Conditions for Overseas Contracts

TWO sets of "General Conditions for the Supply and Erection of Plant and Machinery for Import and Export" which should be of great assistance to electrical manufacturers and purchasers have been drawn up by a Working Party on Contract Practices in Engineering of the Economic Commission for Europe. The new conditions, No. 188A and No. 574A, cover the complete transactions of the supply, delivery and erection of plant and machinery, as distinct from the earlier conditions No. 188 and No. 574 which were concerned with the supply and delivery of plant to be erected by the purchaser.

General Conditions Nos. 188 and 188A provide a set of conditions designed to form a basis for engineering contracts in international trade generally; General Conditions Nos. 574 and 574A differ from Nos. 188 and 188A on a few points that were not acceptable to the Eastern European members of the Working Party, and these are accordingly more suitable for East-West trade.

The new conditions are available from H.M. Stationery Office, or through any bookseller, price 9d each plus 2d postage. The earlier conditions, together with some commentary on them by the Working Party, are also available from the Stationery Office: No. 188 price 5d for the conditions and 9d for the commentary; No. 574 price 5d each for the conditions and the commentary. In addition, Conditions No. 188 have been adopted by the British Engineers' Association and have been reproduced in the "Brown Book" of the British Electrical and Allied Manufacturers' Association, which is shortly to consider reproducing the new conditions. The conditions are all published in English, French and Russian (all texts have equal authenticity) and may soon be expected to be translated into German and Spanish and other European languages. Outside Europe the attention of the Economic Commissions for Latin America and for Asia and the Far East is being drawn to the new conditions.

When the Working Party was set up in 1951 to examine the possibilities of unifying contract practices in engineering within the framework of existing national systems of law, the participating governments made it clear that they did not bind themselves to make use of any results produced or to bring pressure to bear on purchasers or contractors within their jurisdiction to do so. Because of doubts about the likelihood of practical achievement the United Kingdom was not represented on the Working Party at the outset. However, from early in 1952, when the first British representatives were nominated by the Institutions of Mechanical and Electrical Engineers, the United Kingdom delegation has played a leading part.

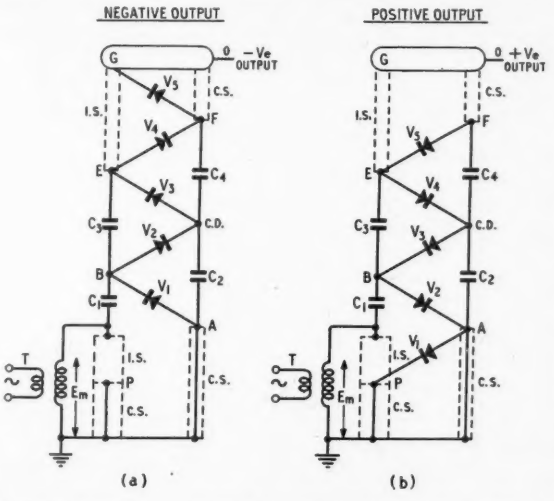
The outcome of proceedings in a study of this sort, which has to take differences in national law and commercial practice into account, must inevitably reflect compromise. However, throughout the proceedings the contract conditions recommended by the Institutions of Mechanical and Electrical Engineers, which are unique in Europe in being drawn to a standard set by two professional institutions, have formed a basis for an independent lead by the British representatives equally acceptable to purchasers and vendors. The appointment to the British delegation in 1953 of a representative of a purchasing organisation (the Central Electricity Authority) strengthened this lead. The United Kingdom representatives are now Mr. K. F. A. Johnston, legal adviser to the B.E.A.M.A., Mr. H. B. Morton, assistant legal adviser to the C.E.A., and Mr. J. F. St. G. Shaw of Messrs. Preece, Cardew & Rider.

Traditional overseas customers for British engineering equipment are generally already accustomed to particular forms of contract such as those recommended by the Institutions of Mechanical and Electrical Engineers. Nevertheless the new conditions drawn up under the auspices of the E.C.E. may commend themselves in overcoming particular problems or in establishing new connections both inside and outside Europe in territories where local law is not based on the Anglo-Saxon model.

Production of High Voltages

Power Frequency, Damped High Frequency, Impulse and Direct

AS the subject of his address as chairman of the North Western Centre of the Institution of Electrical Engineers, Mr. F. R. Perry (Metropolitan-Vickers Electrical Co.) took "High Voltages—Their Production and Application." In this he gave the four types of high voltage available to engineers as power frequency, damped high frequency, impulsive and direct. Modern examples of the first type (all with transformers connected in cascade) were: two 650 kV r.m.s. units to give 1·3 million volts for testing glass insulators (Pilkington Bros.); five 350 kV r.m.s. units to give 1·75 million volts (G.E.C. Inc.); three 750 kV r.m.s. units to give 2·25 million volts to earth to be installed in Moscow and believed to be the highest voltage anywhere. Peak voltages would be 40 per cent more. In addition, a single-unit (non-cascade) one million volt transformer had been installed at the N.P.L.



Modified multi-stage cascade d.c. generator using metal rectifiers as switch links for changing polarity

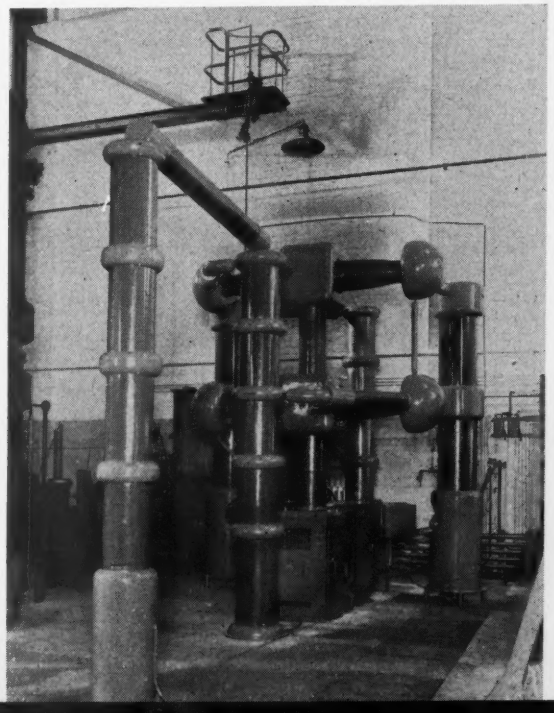
Damped high-frequency voltages from Tesla transformers (50 to 200 kc/s) had been gradually superseded by multi-stage generators in determining behaviour of equipment under transient conditions, since over-voltages caused by lightning were more severe than those due to switching surges, which somewhat resembled damped oscillatory waves. A new form of test was, however, needed to check the insulation strength of transformers in relation to switching surges, possibly involving a.c. at a few hundred c/s.

For impulse testing the tendency now was to build generators in the 3 to 5 million volt range in which a number of condensers were charged in parallel and automatically discharged in series by the breakdown of sphere gaps. Examples cited were: 18 stages, charging voltage 220 kV d.c., impulse voltage output 4,000 kV, energy storage 285 kW sec (Ferranti); two of 17 stages, 300 kV d.c., 5,100 kV each, 95 kW sec each (G.E. Inc.); 24 stages, 300 kV, 7,200 kV, 430 kW sec (Moscow H.V. Laboratory); 16 stages, 344 kV, 5,500 kV, 60 kW sec (France).

Direct voltages, now usually supplied from transformers through metal rectifiers connected in the h.v. circuits were needed for ancillary purposes such as accelerating the electron beams in cathode-ray tubes (3 to 50 kV negative polarity) and for charging impulse voltage generators (100 to 400 kV, both polarities). They were also used for testing underground cables (100 to 400 kV), particularly *in situ* where the large capacitance load would demand too high a kVA from a.c. testing equipment. For obtaining either polarity at more than 300 kV a cascade generator was preferable and in any case means of effecting a rapid change was necessary. This was provided in a compact equipment (Waterton) which had valves placed horizontally in pairs at different levels.

High power frequency and impulse voltages were required for withstand tests on manufactured h.v. equipment or for measuring its flash-over voltages. A second purpose, which required even higher voltages, was to obtain design data concerning the breakdown of air gaps, oil gaps or solid insulation, so that design engineers could have information in advance of immediate requirements and could also estimate what was the margin of safety in existing equipment. In either case the requisite voltages were related to the operating voltage and entailed forecasting the future magnitude of transmission voltages in areas at home and abroad in which British manufacturers might be concerned. Insulation levels had been established only up to 380 kV nominal, but some uncertainty existed as to whether the value would not be reduced from 1,350 to 1,250 kVp for full-wave impulse tests on transformers. On the other hand, an impulse-withstand voltage of 1,450 kVp had been specified for air-blast circuit-breakers. If by 1968 a nominal system voltage of 550 kV proved possible, an impulse generator having a nominal output of 4·5 million volts would be required, allowing margins requisite for the provision of design data and generator regulation.

View of 500 kV d.c. generator with horizontally mounted rectifying valves



Britain and the New European

A GENERAL APPRAISAL

By NICHOLAS A. H. STACEY*

THE Rome Treaty, binding the "Messina" countries—Belgium, Luxembourg, Netherlands, France, Italy and Western Germany—into a Common Market was signed last March and will shortly be ratified by the respective governments. This decision will profoundly affect the course of European economic history. Britain, as the leader of Europe, could not very well contemplate standing completely outside the new European economic structure, nor could she join the Common Market itself on account of her Commonwealth commitments, and as a compromise proposed the setting up of a European Free Trade Area.

Since nearly £940 million out of £3,172 million of all United Kingdom exports and re-exports in 1956 were sold in Europe—£478 million in the Common Market countries—any talk about "contracting out" of Europe and drawing nearer to the Commonwealth as a suggested alternative is against economic reality. What the British Government now must ensure is that the United Kingdom will not be at a disadvantage in the Free Trade Area compared to the other countries. That is, the measure of our concessions must not outrun those of the other countries.

Mr. Reginald Maudling's appointment as Ministerial Co-ordinator for the European Free Trade Area negotiations indicates that the Government has now taken energetic steps to present the British point of view more forcefully.

Integration Past and Present

How and why have these big economic changes taken place in Europe? They have arisen out of the practical foreign trade liberalisation attempts of the various countries in post-war years, starting with the Organisation for European Economic Co-operation, the European Payments Union and the European Coal and Steel Community. But the idea of economic unity is not new; it has strong roots in the past and there are several successful examples. The potential advantages of trading in an enlarged market are, after all, not difficult to comprehend.

The unification of the small German states in the German Customs Union in 1867, the unification of the United States after the Civil War in 1865, the economic integration of Eastern Europe under the pressure of the U.S.S.R. all arise from the belief that a larger measure of economic unity provides material advantages.

Within the current European plans, the Scandinavian states of Sweden, Denmark, Norway and Finland are also devising a Nordic free trading area. In addition to the current European proposals to abolish trade barriers, more recently, five Central American republics—El Salvador, Costa Rica, Guatemala, Honduras and Nicaragua—have attempted to forge closer economic ties. A draft treaty has been completed for the establishment of a multilateral free trading area, embracing all five countries. And finally, to give an idea of the contagious nature of trade liberalisation proposals, European countries at present outside the Common Market and Free Trade Area are making every effort to participate in these schemes in one form or another.

Let us first consider the meaning and implications of the Common Market. It is a customs and economic union and its object is to bring about a unified market comprising the countries concerned. The signatories to the Rome Treaty, in addition to abolishing tariffs and quantitative restrictions, are aiming at:—(*a*) ironing out balance of payments difficulties; (*b*) setting up a European investment fund to help industries in individual countries to adapt themselves to the new economic and commercial milieu; (*c*) financing European projects and schemes in dependent territories; (*d*) gradually harmonising social conditions and fiscal policies; (*e*) ensuring free movement of capital and labour between participating countries; and (*f*) setting up a European Commission and a European Council of Ministers, Assembly and Courts of Justice to formulate and decide policies.

The heart of the Common Market scheme is the gradual elimination of tariffs and the abolition of quotas. This is tantamount to the establishment of a common external tariff against third countries and to the pursuit of a common commercial policy. The elimination of customs duties will be attained during a period of from 12 to 15 years, in accordance with a defined method, but with a more or less flexible timetable. The period of tariff elimination can be divided into three stages:—

Stage I (4 years)	(i)	10 per cent reduction of the original duty on every product within 12 months of the treaty coming into force.
	(ii)	5 per cent reduction of the original duty on every product and 10 per cent reduction of the original total customs revenue within the next 18 months.
	(iii)	Another reduction as (ii) within the next 18 months.

At least 25 per cent reduction of the duty on every product by the end of Stage I.

Stage II (4 years)	(i)	5 per cent reduction of the original duty on every product and 10 per cent reduction of the original total customs revenue within the first 18 months of Stage II.
	(ii)	Another reduction as (i) within the next 18 months.
	(iii)	Another reduction as (i) within the next 12 months.

At least 50 per cent reduction of the duty on every product by the end of Stage II.

Stage III (4 years)	Reduction and abolition of all remaining duties according to a timetable to be decided.

Stage I can, in certain circumstances, be extended by one, two or two-and-a-half years; hence the whole transitional period will be from 12 to 15 years.

Although tariffs between the countries participating in the Common Market will be abolished, these countries will set up a united external tariff structure *vis-à-vis* third countries (not against the countries in the proposed Free Trade Area). Apart from specific exceptions, the common external tariff will be the arithmetic mean of the tariffs of the various members on 1st January, 1957. The common tariff may not exceed:—

(*a*) 3 per cent for most raw materials; (*b*) 10 per cent for most semi-manufactured goods; and (*c*) 15 per cent

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Trading Pattern—1

This article is in three parts. The first two sections attempt a general economic survey of the background to the European Common Market and Free Trade Area proposals. They lead up to the third part which is an endeavour to assess the possible effects of a Free Trade Area upon the British electrical industry.

or 25 per cent for certain chemicals. (For certain chemicals tariffs of less than 3 per cent will be considered to be tariffs of 12 per cent for the calculation of the common tariff.)

For a specified list of products the tariff will be fixed by negotiation and not by calculation. Some of these negotiations are completed but most are still to come. The common tariff will be introduced successively at the end of the three stages: 30 per cent of the difference above or below the common tariff will be removed at the end of the first stage and 30 per cent at the end of the second stage. But if the national tariff is not more than 15 per cent greater or less than the common tariff, the common tariff will be introduced at the end of the first stage.

No change may be made in the common tariff save by unanimous decision of the Council. The Council may, however, by majority vote modify the tariff for a period of not more than six months and for not more than 20 per cent. A member may also be authorised to suspend any part or the whole of the tariff on agricultural products.

Free Trade Area Scheme

The reason for setting out specific details of the operation of the Common Market is because most of its provisions are likely to be applicable to the European Free Trade Area. However, it should be pointed out at the outset that there are significant structural differences between the two concepts. In a Free Trade Area the participating countries abolish duties and restrictions on goods from each other, but unlike Common Market countries they do not have a uniform tariff for goods entering from third countries; they continue to maintain their own tariffs against the outside world.

British participation in the European Free Trade Area is only desirable if the close economic ties with the Commonwealth are not weakened. That is why in the original British plan European food and agricultural products were to be excluded from the operation of free tariffs. Since 90 per cent of all United Kingdom imports from the Commonwealth is food or raw materials, only 10 per cent of Commonwealth imports, i.e. manufactured goods, would be penalised. As a result, industrial goods from Canada, India or Australia would continue to be subject to the usual low British tariff rate of imperial preference, but when the Free Trade Area was in full operation they would be less competitive against European goods. Since, however, Commonwealth industrial goods would still enjoy imperial preference they would retain their competitiveness against manufactures from the United States or Japan.

As the recent Commonwealth Premiers' Conference has shown, and as other discussions with Commonwealth leaders indicate, this position is fully acceptable since it is hoped that by enlarging the volume of European trade other nations, particularly the Dominions, will benefit in the long run.

It now seems, however, that Britain's original proposals will have to be amended. Fresh suggestions are now being put forward by the United Kingdom Government which would allow for British participation in trade in agriculture with European countries. It would seem that basically the European countries are interested not so much in free trade in agriculture as in some degree of controlled trade which, probably, would allow them a slightly larger share of the United Kingdom's imports of food products.

Britain has always imported immense quantities of food from European countries and has been their best customer. The question which will have to be answered at some future date is whether additional food imports from Europe would significantly interfere with the protection afforded to our farmers at home for defence reasons or with the flow of Commonwealth imports.

So much for the general outline of the implications of the emerging new European trading structure. The Common Market countries, to reiterate, are Benelux, France, Western Germany and Italy. Those initially proposing to participate in the Free Trade Area are the United Kingdom, Denmark, Sweden, Norway, Austria and Switzerland. Other countries who would like to join, some on special terms, are Finland, Greece, Ireland, Turkey, Spain, Portugal and Iceland.

Implications for Britain

Would it be more advantageous for the United Kingdom to stay outside the Free Trading Area, or is it imperative that she should join? These are questions which should be examined by every manufacturer or distributor of goods, as well as by every consumer. It is remarkable that this most important proposed shift in British commercial policy for decades should be discussed so little and should arouse so few passions in the general public. The Government's decision to negotiate for a Free Trade Area is almost more momentous than the abolition of the Corn Laws or the ratification of the Ottawa Agreement.

As for the industrial community in the United Kingdom, it does seem that the economic implications of the Free Trade Area and the reasons for this country to participate in it have not been too fully explained by Government spokesmen. As a result judgment is based only too often on the vaguest available data and sometimes on incomplete assumptions.

It is hoped that the recently inaugurated regional conferences in industrial centres under the auspices of the United Kingdom Council of the European Movement, in co-operation with the Regional Councils for Industry, will help in presenting the outlook for British industries in the Free Trade Area. So far we have often been confronted with the rejection by the leaders of certain industries of much that has been proposed without their giving any indication of what they would be prepared to support.

But it should be made amply clear that Britain's refusal to join the European Free Trade movement would ensure Germany's growing economic and political ascendancy in the Continent of Europe.

European Trading Developments

The growth of trade between the Common Market countries, and of trade between them and the outside world in recent years has been remarkable. Between 1952 and 1955 the value of world imports rose by 10 per cent, the imports of Continental Western Europe 24 per cent and those of the sterling area 3 per cent. Imports of the six member countries of the European Coal and Steel Community (Italy, France, Western Germany, Belgium, Luxembourg and the Netherlands) rose by 27 per cent; and their imports from each other faster still, by 53 per cent.

The six Messina countries together have a population of 162 million (nearly the same as the United States with 168 million) and with the proposed Free Trade Area countries, including the United Kingdom, this would increase to 240 million. Their gross national product is rather less than a third of that of the United States, at official exchange rates, but a good deal larger than a third in terms of actual purchasing power. Together, the six countries provide a market for a fifth of total world exports and the same proportion of exports of manufactures.

With the rapid rise in trade between the six countries in the Common Market, the proportion of inter-area imports to total imports rose from 24 per cent in 1952 to 30 per cent in 1955. Imports from the United States fell from 14 to 12 per cent while imports from the United Kingdom remained unchanged at 5 per cent. The United States' share fell in each major group of manufactures. The United Kingdom's share remained unchanged at 10 per cent for chemicals and semi-manufactures; and fell from 18 to 15 per cent in machinery and transport equipment. The most striking falls in this group were in road motor vehicles, ships and boats and aircraft. Our share in non-electric power-generating machinery and metal-working machinery imports rose.

British Trading Pattern

As a starting point, it is necessary to establish the importance of Europe in the United Kingdom's trading pattern (Table 1). Three simple fractions summarise the main flow of our trade: just under half is with the Commonwealth, about a quarter is with Europe, of which half again is with Common Market countries. These proportions broadly apply to both imports and exports.

In 1956 the biggest single market for United Kingdom exports was the United States (£259 million) followed by Australia (£241 million), Canada (£182 million), India (£170 million) and South Africa (£157 million). However, when the six Common Market countries are viewed as a single unit, United Kingdom exports to them (£478 million) exceeded exports to any other country. Similarly, the Common Market countries taken together have been the major suppliers to the United Kingdom. The importance of Continental Europe is further stressed if the five Free Trade Area countries are also included, for then a single geographical unit provides 22 per cent of the United Kingdom's imports and takes 24 per cent of her exports. Within Europe our best markets are the Netherlands, Western Germany, Sweden, France and Denmark. These countries are also the United Kingdom's chief European suppliers.

Factors other than the present trade pattern, however, have to be borne in mind in examining potential trade; for example, the population and income per head of the various markets. The total population of the combined Common Market and Free Trade Areas is greater than the population of any single market of the United Kingdom, except India. Bearing in mind the difference in income per head and income distribution in India and Europe, it is obvious that the Common Market and Free Trade Area present the largest potential market in the immediate future for United Kingdom goods. The unified market of the six Messina countries alone ranks second only to the United States in size and wealth.

If United Kingdom exports are examined in relation to the size of their markets, it will be seen that the

Table I.—United Kingdom's trade with the various groups

	U.K. Imports, 1956, from (£ million)	U.K. Exports* and re-exports, 1956, to (£ million)	Population (million)	U.K. Imports per capita £	U.K. Exports per capita £
Total United Kingdom trade	3,889·2	3,318·4	—	—	—
Europe	993·2	939·4	282·4	3·5	3·3
A. Common Market	493·3	478·4	162·2	3·0	2·9
B–A .Free Trade Area	357·3	317·9	27·1	13·2	11·7
B2. Rest of Europe	142·6	143·1	93·1	1·5	1·5
A. Common Market	493·3	478·4	162·2	3·0	2·9
Belgium	72·9	73·3	8·9	8·2	8·2
Luxembourg	3·0	0·4	0·3	10·0	1·0
France	112·4	102·1	43·6	2·6	2·3
Italy	57·6	64·1	48·0	1·2	1·3
Netherlands	137·4	127·1	10·9	12·6	11·7
W. Germany	110·0	111·4	50·5	2·2	2·2
B1. Free Trade Area (including A)	850·6	796·3	189·3	4·5	4·2
Switzerland	29·9	35·0	5·0	6·0	7·0
Austria	11·3	13·3	7·0	1·6	1·9
Denmark	112·6	83·6	4·4	25·6	19·0
Sweden	145·0	109·0	7·3	19·9	14·9
Norway	58·5	77·0	3·4	17·2	22·6
B2. Rest of Europe	142·6	143·1	93·1	1·5	1·5
Finland	66·6	47·1	4·3	15·5	11·0
Greece	7·5	24·4	8·0	0·9	3·0
Iceland	1·7	3·1	0·2	8·5	15·5
Portugal	17·0	21·3	8·8	1·9	2·4
Spain	34·4	28·8	29·2	1·2	1·0
Turkey	8·1	9·2	24·8	0·3	0·4
Yugoslavia	7·3	9·2	17·8	0·4	0·5
C. Commonwealth	1,074·6	975·5	519·4	2·1	1·9
Australia	236·4	241·0	9·4	25·1	25·6
Canada	347·6	182·3	16·0	27·1	11·4
Ceylon	39·2	26·0	8·6	4·6	3·0
India	141·5	169·7	381·7	0·4	0·4
New Zealand	179·0	127·9	2·2	81·4	58·1
Pakistan	22·8	32·8	83·6	0·3	0·4
South Africa	91·2	156·6	13·7	6·7	11·4
Ghana	16·9	39·2	4·2	4·0	9·3
D. Other selected British Territories	359·0	324·3	68·5	5·2	4·7
Nigeria	90·9	63·2	29·7	3·6	2·1
Fed. Rhodesia and Nyasaland	108·0	58·7	7·1	15·2	8·3
Tanganyika	10·3	13·3	8·4	1·2	1·6
Kenya	11·8	36·1	6·2	1·9	5·8
Uganda	7·3	8·2	5·6	1·3	1·5
Singapore	34·4	42·0	1·2	28·7	35·0
Malayan Fed.	42·9	40·4	6·0	7·2	6·7
Hong Kong	20·1	33·1	2·3	8·7	14·4
Jamaica	25·2	20·6	1·5	16·8	13·7
Brit. Guiana	8·1	8·7	0·5	16·2	17·4
E. United States	408·5	258·8	168·1	2·4	1·5

* (Excluding French Morocco—exports in 1956 £6·3 million.)

United Kingdom is a much more important supplier for most Commonwealth people than for Europeans. For example, in 1956 the United Kingdom supplied on average £58 of goods to each New Zealander, £26 to each Australian, and £11 to each South African and Canadian. By contrast, the United Kingdom sold £12 of goods to each Dutchman, £8 to each Belgian, only £2 to each German and Frenchman and £1 to each Italian. To show that Europeans will buy more British goods, it should be appreciated that Norway took £23 per head, Denmark £19, Sweden and Iceland £15 and Finland £11.

Britain has, therefore, concentrated hitherto on supplying more intensively some Commonwealth and smaller Scandinavian markets rather than the larger national markets of Europe. The Continental core, with a substantially smaller saturation of British goods and larger income per head, comparable to the white Dominions and Scandinavia, should be capable of absorbing a much greater volume of British goods.

Economic Repercussions

In discussing such a significant change in Britain's commercial relations, which affects both the Commonwealth and her trading partners all the world over, one must scrutinise both the advantages and disadvantages of such proposals. To begin with we must appraise (*a*) the wider economic implications of participation, (*b*) the economic outlook for Britain and Europe, (*c*) the effects on the Commonwealth and (*d*) the consequences for domestic industry.

There is no doubt that if the Free Trade Area is established, European products will enjoy increasing advantages in our domestic market. In from 12 to 15 years all tariffs will be abolished. In the classical economic sense this means that a higher degree of "perfect" competition will have been established. Whether this reinforced competition is less imperfect than the usual competition between states or not, it will fundamentally alter certain sections of the British industrial scene. Such industries as cotton or watch and clock manufacturing will suffer as a result of keen competition. But taking the whole of British industry, the proportion that will be exposed and is expected to suffer in consequence is not as large as is generally believed.

As leading industrialists' articles on the Common Market earlier this year in the *Sunday Times* appear to show, there is much caution about the effects and operation of freer trade, but few would contend that British industry is not sufficiently resilient to stand up to it. For it should be remembered at the outset that if we are unable to compete with European industry in Continental markets or on our home ground, our chances of competing with it in third markets, where both British and European manufacturers are on a level footing, are not very promising. Take the position of the cotton industry: it may well be that free trading will depress it further, but it has suffered continually since the beginning of the first world war. The output of the cotton industry to-day is less than the value of exports to India alone before 1913. And, it should be added, the industry is not suffering from "foreign" competition, but from the competition of such British overseas countries as India and Hong Kong.

Certain industries may gain considerably from an enlargement of their market. The relatively "new" industries of aircraft, chemicals, sections of the electrical industry, and aluminium, as well as some traditional ones like woollens, iron and steel, shipbuilding and certain other engineering products, will have good prospects for further expansion. Cotton textiles are likely to suffer from intensified European competition and, probably, so will those manufactures which have enjoyed a goodly measure of protection in the past, e.g. the optical and photographic industry, the watch and clock industry, glassware and cutlery.

Nor should it be forgotten that British protective tariffs will not be lowered *in toto* at the outset of the operation of a Free Trade Area scheme; it will take from 12 to 15 years to eliminate tariffs. What does this mean in terms of lowering the price differences between British and foreign goods in the United Kingdom? It means that if the average rate of tariffs is 30 per cent *ad valorem*, then the landed cost of imported goods will be lowered (over a 15-year period) by 2 per cent per annum. This surely is not a catastrophic price cut, even if transmitted by the distributive chain in full, and it should be remembered that United Kingdom merchandise will enjoy the same benefits in Europe.

Leeds Company's Jubilee

THIS year Green & Smith, Ltd., electrical engineers and contractors, of Leeds, are celebrating their golden jubilee, while their associated business of Wallis & Watson celebrates its diamond jubilee.

The company was founded by the present chairman, Mr. J. D. Green, and Mr. W. I. Smith, as partners at Low Hall Mills, Holbeck, where they commenced manufacturing transformers. At the beginning of the 1914-18 war Mr. Smith severed his connection with the company to join a firm of electrical engineers in Norfolk. The company transferred its works to Great George Street and took on war work until 1919, when the business was again moved to its present premises, Albert Works, Meadow Lane, Leeds, where Mr. W. G. Craven joined the management and a private limited company was formed. In 1927, on the death of Mr. E. C. Wallis of Wallis & Watson, the company acquired this business which carried on as a subsidiary at Bardon Chambers, King Street, Leeds. Mr. J. D. Green retired from the business at the end of 1954, and his son and the son-in-law of Mr. Craven (Mr. J. A. Richardson) now take an active part in the business as directors.

Both concerns commenced business when electrification as we know it to-day was in its infancy, and early developments included the "Leeds" transformer, designed by Mr. T. D. Green to reduce the mains voltage of 200-230 down to 110 in connection with the first squirted filament lamps, for which the highest voltage was 110. Some of the recent large contracts carried out include the lighting and heating and subsidiary power installations at Wakefield "B" power station, the installation at University House, Leeds, factory power, lighting and heating installations for Unilever, Ltd., Leeds, and the complete lighting and heating in St. Anne's Cathedral, Leeds. Equipment produced at the works includes main switchboards and control panels, while repairs are undertaken to all classes of electrical plant and machinery.

The company recently held a whist drive and dance at the Astoria Ballroom, Leeds, which was attended by over 300 employees, and the guests included representatives of the supply, manufacturing and wholesale sections of the electrical industry. The Lord Mayor and Lady Mayoress of Leeds were also present.

NEW BOOKS

An Introduction to Semi-Conductors. By W. Crawford Dunlap, Jnr. Pp. 417; figs. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 94s.

The author in his preface describes two sorts of people for whom this book is written. They are, first, those engineers, technicians and research workers who are entering on active work with semi-conductors and, second, students wishing to supplement course work on solid state theory. It is probable that it will be more valuable to the former class of reader, since the first third of the book consists of a lightning survey of the theory of the solid state which would in all likelihood be more thoroughly covered in the academic work of the student who is interested in gaining a further understanding of technically important semi-conductors. However, the usefulness of this section to the engineer who has not received any formal instruction in what was, until quite recently an abstruse field of theoretical physics should be very considerable. An introductory chapter is followed by one on crystal structure, then chapters on the solid state, imperfections in crystals, statistical mechanics and the electron theory of metals and semi-conductors. The treatment does not pretend to be exhaustive or rigorous, but few aspects of these subjects fail to receive some attention.

The remaining two-thirds of the book deal specifically with semi-conductors, with, naturally, a heavy emphasis on germanium. There are chapters on contact and surface properties of semi-conductors, properties of p-n junctions, and experimental measurements on semi-conductors. Then follow chapters on methods of preparation, the properties of germanium, silicon, other elemental semi-conductors and semi-conducting compounds. The final chapters deal with rectifiers, including selenium, copper oxide and copper sulphide area rectifiers and germanium point contact and power rectifiers; then with transistors, photocells, thermistors and other semi-conductor applications. It will be seen that a very wide field is covered by the book, and with the slight reservation noted above it can be recommended as a good introduction to the field.—P.L.D.

Radiation Shielding. By B. T. Price, M.A., C. C. Horton, B.Sc., and K. T. Spinney, B.Sc. Pp. 350; figs. Pergamon Press, Ltd., 4 and 5, Fitzroy Square, London, W.1. Price 60s.

This very attractively printed and bound volume, one of the International Series of Monographs on Nuclear Energy, will be required reading for an increasing number of engineers and technologists as reactor design ceases to be the prerogative of Government establishments and becomes a branch of the power industry.

In the early days the processes involved in the reduction of gamma ray and neutron intensities to an acceptable level outside a shield were imperfectly understood: moreover, simple methods of calculation led to shield designs which were safe, although they may have been bulky and heavy, and involved unnecessary constructional refinement and expense. However, what was acceptable in yesterday's experimental reactors is no longer so when commercial exploitation is involved, while the use of nuclear power for such purposes as ship propulsion places a premium on compactness. The present work is written, as the authors state, as a textbook, rather than a ready-reckoner. The theoretical treatment is extensive, and it is backed up by an impressive quality of data in both tabulated and graphical form, taken from work published up to and including the present year.

The book is divided into four main sections, preceded by a short but thorough section on the biological hazards against which protection is to be assured. The attenuation of gamma and beta radiations is the more straightforward problem, since the processes involved have been known for a longer time, and the radiations can be more conveniently detected. The theory of neutron shielding is much more complex, and there is a correspondingly greater use of semi-empirical methods. Consequently, the section on neutron attenuation in thick shields is preceded by a thorough discussion of general neutron physics. There follow data on attenuation and some consideration of the effect of ducts and voids in the shielding.

The largest section of the work covers the shielding problems encountered in actual reactors, the heating effects in the shield and the general considerations to be taken into account in the choice of shielding materials, such as the increased cost of special concrete mixes and other high density materials, against which may be set the reduced overall dimensions which may lead to compensating economies, for example, in the size of building required to house the reactor. Throughout this section there is a continued emphasis on the necessity of a balanced appraisal of the variables affecting the total cost of the complete installation. Finally, a number of miscellaneous topics are treated, including the activity induced in coolants, the design of viewing windows and bean traps for experiments.—P.L.D.

Neutron Cross-Sections. By D. J. Hughes. Pp. 182; figs. Pergamon Press, 4 and 5, Fitzroy Square, London, W.1. Price 30s.

The subject of the interaction of neutrons with matter embraces an astonishing diversity of phenomena. The main reason for the great variety in the behaviour of neutrons is that they are to interact effectively with nuclei over a very wide energy range. The measure of this interaction of neutrons with matter is known as the neutron cross-section, and the range of phenomena mentioned above is reflected in the range of types of cross-sections that can be measured. Neutron cross-sections are measured in units of area, the almost universally used "barn" being equal to 10^{-24} sq cm. The magnitudes of cross-sections vary from megabarns to microbarns. The subject of neutron cross-sections is the very heart of neutron physics, for in one sense almost the whole of neutron physics is just the study of cross-sections.

In this most readable book the author gives a clear and concise explanation of the principles of cross-section theory, measurement and use. It deals with types of cross-sections and principles of measurement, cross-sections and nuclear structure, fast neutrons, neutron resonances, resonances in fissionable nuclides and, finally, thermal neutrons.

One of the main purposes of the book is to assist in the understanding and use of BNL 325 which is an evaluation of experimental results of cross-section measurements from laboratories throughout the world compiled by members of "Sigma Center" at Brookhaven National Laboratory in the United States. The present book will undoubtedly increase the usefulness of the compilation by clarifying the relationship of cross-section data to fundamental nuclear structure.—R.P.

VIEWS on the NEWS

By REFLECTOR

OUR rivals in the gas industry make extensive use of electrical service and so does another concern which to some extent is a competitor. This is the London Hydraulic Power Co., of whose operations the average Londoner knows very little. It is not generally realised how many London lifts are hydraulically operated, to say nothing of the lock and sluice gates, capstans and bridges of the Port of London Authority, theatres' fireproof curtains, cinema organ lifts, etc. All this equipment is supplied with water at a pressure of 700 p.s.i. or more by about 180 miles of underground mains. I am indebted for this information to *London Electricity* which describes the conversion of the company's steam pumping plant to electrical operation. At the Grosvenor Road pumping station the boilers needed renewing but after consideration of the cost of replacement, as well as the running cost, the company decided to have the three-throw steam pumps, which were still in good condition, operated by electric motors. The cheaper operation and simplification thus achieved encouraged the company to convert its Wapping station and now the two remaining stations are under consideration. The electricity consumption is already 5 million kWh a year and it is expected that the company will become one of the London Electricity Board's largest consumers.

* * *

An extraordinary method of producing cattle fodder in remarkably quick time is recorded in the *Electrical World* (New York). This is an "oat growing" machine made in two sizes. The smaller one has 60 growing trays and the larger 120. The trays are filled with 4½ to 5 lb of grain seed which is soaked to speed up germination and during the six-day cycle is fed with water and chemical plant food. The correct temperature and humidity are maintained by air conditioners with resistance heating elements or heat pumps. Light energy for photosynthesis is provided by fluorescent and incandescent lamps. The report states that a large unit on a Texas farm produces forage for 35 cows for an energy consumption averaging 30 kWh a day with a peak demand of about 7 kW. By this means oat plants 8in high are grown in six days.

* * *

Reflections of the restrictions upon expenditure on the reinforcing of distribution networks are still arising in many parts of the country. For example, at Neyland, according to the Haverfordwest *Western Telegraph*, until 10 p.m. full lighting is unobtainable and there is trouble with television sets. When the subject was discussed by the Urban Council one member said he knew very little about possible causes but he had heard it said that they were using a lot of electricity at the Technical College. That sounds as if the residents are at least suffering in a good cause. It seems that there is no point in the electricity consumers threatening to go over to gas, for at the same meeting a councillor said that the supply of gas in the town was reduced by half between the hours of 12 and 4. Altogether an unfortunate town.

* * *

Lord Chandos, chairman of Associated Electrical Industries, Ltd., was the principal guest at the annual dinner of the Association of British Chemical Manufacturers last week. In the course of his speech he referred to the contradictory requirements of the Government—the need to improve productivity and thus reduce export prices while making it difficult to raise the necessary money for the purpose. He considered that this was an impossible combination "even to chemical companies" let alone engineering concerns.

* * *

In a letter to *The Times* a correspondent says that he has seen at a maintenance depot a notice at the time recorder: "Queueing at this clock is not permitted more than five minutes before clocking out time." He goes on to ask whether this queueing is regular practice in most factories and to suppose that there is no queue for clocking in in the morning. I know that there is a good deal of time-trimming in works but if queues are necessary through lack of insufficient time recorders the men can hardly be blamed for trying to be among the first out. I have seen morning queues but whether before or after starting time I am not sure.

* * *

An interesting item in the *Electrical Review* of 21st October, 1887, was a report of the first annual meeting of the Water Primary Battery Co., Ltd. The battery was the invention of a Frenchman named d'Humy and I gather from the report that the battery employed iron and carbon plates with a certain amount of nitric acid. Members of the board of the company and the inventor himself made some pretty wide claims for the battery and some glowing promises of results from its exploitation. Monsieur d'Humy alleged that he had been offered £30,000 for the French rights and about the same for the Spanish rights and apparently several other countries were after concessions. The battery would supply electricity at exactly the price of gas. He expected that the shareholders would receive a dividend of 100 per cent next year. The chairman (Col. G. B. Malleson) thought that the shareholders "must have been struck with wonder and admiration at the ease with which the light could be produced under the company's system, and which when produced by the ordinary way of dynamo caused great disturbance in private houses, and a great deal of unpleasant noise in large premises."

Still in the end the dynamo won.

Russian Engineers' Visit

Mr. F. G. Loginov Praises British Works and Equipment

THE mutual benefits to British electrical manufacturers and to the Russian power supply industry that would result from a lifting of the present embargo on the export of certain heavy electrical plant were referred to by Mr. F. G. Loginov, Chief Deputy of the Minister of Electric Power Stations, U.S.S.R., at a Press conference in London last week. Mr. Loginov is the leader of the delegation of seven Russian engineers who have been making a two-week tour of British power plants and factories.

Since the Russians were mainly concerned with hydro-electric power, their most extensive tour was of the installations of the North of Scotland Hydro-Electric Board. They were particularly interested in the methods of tunnelling, since world tunnelling records have been set up on one or other of the Scottish projects. Other places visited included the Mechanical Engineering Research Laboratory, East Kilbride; John Brown & Co., Ltd., Clydebank; Calder Hall; Metropolitan-Vickers, Manchester; the English Electric Co., Ltd., Stafford; Drakelow power station; the 275 kV Elstree substation; the Leatherhead laboratories of the Central Electricity Authority; and the Hydraulic Research Laboratory at Wallingford.

In a prepared statement Mr. Loginov expressed the delegation's great appreciation of the arrangements made for their visit and of the opportunities they had been given for inspecting British power installations, factories and research establishments. He also remarked on the friendly and businesslike attitude of everyone the delegation had met.

Mr. F. G. Loginov, the Chief Deputy of the Russian Minister of Electric Power Stations and leader of the delegation of Russian engineers, is greeted by Sir George Nelson, President of the Institution of Electrical Engineers, on his arrival at the Press Conference

They had known before coming that the scale of the Scottish schemes was small but they had been impressed to find that 30 per cent of the estimated potential had been harnessed and that this proportion would be increased. They had also been impressed by the transformer and turbo-alternator shops at Manchester and Stafford and by the arrangements for switchgear testing. The high finish of the equipment they had seen also drew favourable comment from the Russians.

Answering questions about the relative positions of British and Russian industry, Mr. Loginov pointed out that Russia, unlike Scotland, had been very generously endowed by nature with water-power resources. As a result, although only 2 per cent of these had so far been utilised the installed capacity of hydro-electric plant was over 7 million kW. Russia had several large rivers that could each take an installed capacity of 10 million kW. Alternators of 200 MW were being installed at the Bratskaya hydro-electric station in Siberia, which would have a total installed capacity of 3,200 MW, and at the 9,000 MW Krasnoyarsh station the installation of 300 MW units was planned.

Gas Council's Report

Effects of Hire-Purchase Restrictions

A NET surplus of £3,803,856 on a gross income of £370·6 million is shown in the report of the Gas Council for the year ended 31st March last (H.M. Stationery Office, 8s). All twelve Area Gas Boards showed a surplus. In the eight years since vesting date £369 million has been invested in fixed assets, of which £130 million has been provided from depreciation reserves.

The number of gas consumers rose by 83,780 to 12,875,987, of whom 12,125,748 were domestic consumers. Sales of gas, which reflected the abnormally mild winter, amounted to 2,607 million therms, as against 2,649 million therms in the previous year, a decrease of about 1·6 per cent. Domestic consumers took 1,328 million therms (against 1,350 million in 1955-56), and industrial consumers took 749·6 million (against 751 million). The average revenue per therm rose from 17·7d to 19·1d.

During the year new gas-making plant with a total capacity of 102 million cu ft per day was brought into use. Of this plant, six installations, with a total nominal capacity of 12·5 million cu ft per day, were for the gasification of oil. Investigations into new sources of gas, including natural gas and the import of natural gas in the form of liquid methane, were continued.

In a year that felt the full effect of the increased restrictions on hire-purchase and the increases in purchase tax, the sales of the main domestic appliances on hire-purchase terms fell by 14·4 per cent, while cash sales decreased by 4·5 per cent. The sale and hire-purchase of appliances resulted in a net charge of £821,914 on the accounts of the industry, as compared with a net charge of £202,811 in the preceding year. The following table shows the total sales of appliances for cash or on hire-purchase.

Type of Appliance	Numbers Sold (000's)	
	1955-56	1956-57
Cookers	584·8	522·3
Space Heaters	159·1	131·1
Water Heaters	177·2	171·8
Wash Boilers	190·3	183·6
Washing Machines	35·2	36·8
Refrigerators	22·0	12·2

For comparison, it may be recalled that the sales of these types of appliances by the Electricity Boards during 1956-57 were: cookers, 214,800; water heaters, 177,500; wash boilers, 69,200; washing machines, 69,300; and refrigerators, 33,400.

Designing for Harmony

AT the opening meeting of the 1957-58 session of the Illuminating Engineering Society at the Royal Institution on 8th October, Mr. E. B. Sawyer (manager of the Lighting Service Bureau) was inducted as president and delivered his address entitled " Lighting for Harmony."

Mr. Sawyer said that the time had come for a radical change in the outlook of lighting designers. A revolution in lighting design had been going on for some time and the effects could be seen in many types of modern buildings. But it was the exception rather than the rule for users to demand lighting which was imaginative rather than that of the highest efficiency and cheapest. The future of lighting lay in planning installations suitable for their purpose with æsthetics as the foremost factor.

A change in the lighting engineer's approach became possible with the introduction of the fluorescent lamp, but the lamp came along at a time when efficiency was the dominant factor and not amenities. Too many designers were still obsessed with efficiency. As a rule, lighting was satisfactory only when it provided the right psychological background for the particular purpose.

The closest possible collaboration between architects and lighting engineers had been advocated for a long time but lighting was still an afterthought to be added at such cost as was permissible after all other services had been paid for. Perhaps this was because the majority of users were not yet convinced of the value of a good lighting installation. On the other hand, the lighting engineer had not been sufficiently enterprising, imaginative and skilful in putting forward suggestions pleasing to the architect and his client. The emphasis during their training had been on engineering to the exclusion of everything that went to build up the interest of a visual scene.

If installation design was based on appearance, bearing in mind acceptable brightness and uniformity, it was almost certain that the illumination received at places where it mattered would be at least adequate and probably well above the recommended minima.

The fully equipped lighting specialist should understand not only lighting principles but also the elements of architecture and interior decoration and should have more than a cursory knowledge of electrical installation. In the training of such specialists there was a parallel in industrial design. The shape and finish of appliances was formerly the responsibility of the engineer, but with changing tastes in design the industrial designer was born; he was an artist by training and inclination but with further specialised training he had developed the necessary industrial appreciation and knowledge. Courses on interior design and industrial design might provide the basis for a course of study for the complete interior designer.

Heed should be taken of the comment of a prominent architect that lighting was an admirable subject for post-graduate study by architects.

British Columbia Power Developments

IN our last issue we reported that the British Columbia Electric Co., Ltd., was negotiating with British manufacturers for plant for a new thermal power station. It is now announced that the Metropolitan-Vickers Electrical Export Co., Ltd., has received a contract for four 150 MW steam turbine-generator sets together with condensers and steam auxiliary equipment. Two further generating sets, of the same capacity and with similar condensers and associated equipment will be ordered at a later date, bringing the total value of the contract to $30 million.

This is the largest dollar order for steam turbine-generator plant of its kind ever placed in this country. Dr. T. Ingledow, vice-president and executive engineer of the British Columbia Electric Co., arrived in this country several days ago to negotiate the contract, at the same time appointing Balfour, Beatty & Co. as consultants. The first two generating sets will be commissioned in January and August, 1961.

The generators will be of the hydrogen-cooled type, with hydrogen at a pressure of 30 p.s.i.g., and will generate at 16·5 kV, three-phase, 60 c/s, 0·9 power factor. They will be direct coupled to turbines running at 3,600 r.p.m. The turbines will be of the Metropolitan-Vickers three-cylinder, close coupled, reheat type, designed for initial steam conditions of 1,800 lb/sq in, 1,000 deg F, with reheat to 1,000 deg F. A six-stage feed heating system will be employed, including de-aerating plant, and the final feed water temperature will be 460 deg F. The turbines and generators will be manufactured at the Metropolitan-Vickers Trafford Park Works, and the condensing and feed heating plant at the company's Germiston Works, Glasgow.

It will be recalled that within the last two or three weeks the British Insulated Callender's Group has received an order, valued at $3·5 million, for an additional circuit in the 138 kV submarine power cable link between Vancouver Island and the mainland of British Columbia.

" Greatest Hydro-electric Project "

The announcement of the Metropolitan-Vickers contract was immediately preceded by an announcement in British Columbia by the Premier, Mr. W. A. C. Bennett, of plans for a hydro-electric power project in the Rocky Mountains which would be " the greatest hydro-electric power project in the world." The Government of the Province of British Columbia had entered into an agreement with the Wenner-Gren interests which paved the way for a start in the near future in the Rocky Mountains Trench.

When undertaken, it would result in the development of some four million horsepower and would include the largest man-made lake in the world. It was proposed, in reports submitted by the British Thomson-Houston Co., Ltd., which had been making a preliminary survey of the hydro-electric potential of the area on behalf of the Wenner-Gren interests, to construct a dam across the Peace River and create a lake which would extend a distance of some 260 miles.

Mr. R. W. Bonner, Attorney-General of British Columbia, who is leading a trade mission in Britain, said in London last week that the plant was expected to start supplying power by 1964. British and other European capital, together with Canadian, would be jointly employed in financing the undertaking.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents

The EMP Electric Case

WE have read the report concerning this company on page 607 of your issue of 4th October and desire to draw your attention to the following two matters:—

We feel that the first paragraph of the report suggests whilst we were found "not guilty" of falsely applying "AC5" to the 600 A and 400 A fuse links, we may have been found guilty of this offence in relation to the other two fuse links with which the case was concerned.

We should like to make it clear that initially the Board of Trade was alleging that the AC5 mark had been falsely applied to all four fuse links. They nevertheless withdrew this charge in regard to the 200 A fuse link during the preliminary proceedings before the magistrates and took the same step in regard to the 250 A link at a fairly advanced stage of the proceedings at the Central Criminal Court.

The other matter to which we desire to draw your attention is contained in the fifth paragraph of your report in which it is suggested that Mr. Dannenberg stated that the mounting used by Mr. Leeder was "a makeshift affair." In point of fact that particular expression was applied by Mr. Leeder himself in the evidence which he gave in the magistrates' court.

Tottenham, N.17. I. E. HUMPHREYS,
Director and Secretary,
EMP Electric, Ltd.

Professional Engineers' Status

YOUR readers are entitled to a fuller explanation of the claims made by your correspondent, Mr. A. M. F. Palmer, writing on behalf of the E.P.E.A. (*Electrical Review*, 4th October). He says that his membership is more than three times that of the Engineers' Guild, but what proportion consists of qualified engineers (i.e. corporate members of the Institutions of Civil, Mechanical and Electrical Engineers) and how many members of N.A.L.G.O. (non-engineers) have been accepted by the E.P.E.A. since nationalisation? Corporate membership of any of the three Institutions is a condition of joining the Guild. Increased membership is easily obtained by watering down entry qualifications and the E.P.E.A. has not been known to acknowledge such recognised qualifications as corporate membership preferring its own standards.

The National Agreement, of which the E.P.E.A. is one of the two contracting parties, is for the technical engineering staff (excluding managerial grades) of the Electricity Boards which is very different from Mr. Palmer's claims both as to managerial status and top salary scales. According to Press reports salaries of chairmen will go up by £2,000, in addition to the increase at the last budget by income tax concession. Will Mr. Palmer compare these increases to the marked improvements in salaries brought about by the vigorous E.P.E.A. campaign of this year which he mentions.

As to the Herbert Report and the claim that the E.P.E.A. puts strong emphasis on engineers occupying the leading managerial posts, if their efforts (or lack of them) where reorganisations have taken place since nationalisation are any guide, it is going to be a very grim outlook for engineers in any future reorganisation.

"ENGINEER."

I.E.E. Regulation 301 (B)

THERE would appear to be some misunderstanding with regard to the interpretation of the above Regulation, which was included in the list of "Common faults disclosed by our inspecting engineers" attached to the first progress report of the National Inspection Council covering the period 10th August, 1956, to 15th May, 1957.

In this list under the above heading the common fault was indicated as "the installation of 250 volt rated control equipment connected to single-phase wiring where such wiring is installed in the same conduit, trunking or duct, housing wiring connected to a different phase. In all such instances the control equipment must be rated at 500 volts." This has wrongly been understood as requiring that single-pole-and-neutral fuse units connected to 4-pole busbar assemblies must be of 500 volt rating; this is incorrect if the outgoing wiring from the control unit is segregated from the wiring of any other phase.

The 500 volt rating would be required if the outgoing single-phase circuit were taken in any part of its run, into the same enclosure, i.e. conduit, trunking, duct, busbar chamber, etc., together with wiring from a different phase, so that there would exist in effect, a difference of potential between the circuits in excess of the low voltage maximum of 250 volts.

I shall be grateful if you will publish this letter in your correspondence column so as to remove any possible misunderstanding as to the interpretation of Regulation 301 (B) which would be applied by the National Inspection Council's Inspecting Engineers.

London, S.W.1. E. J. SUTTON,
Chief Technical Officer,
National Inspection Council for Electrical Installation Contracting.

New Atomic Patents

THE specifications of three patents developed within the United Kingdom Atomic Energy Authority are about to become generally available. They are all connected with the design of the graphite structure used in the building of Calder Hall nuclear power station. As is generally known, the purpose of the graphite is to act as a moderating material which slows down neutrons released by fission to a speed which ensures the maintenance of the reaction. At Calder Hall 1,200 tons of high purity graphite is used in each reactor, in the form of nearly 60,000 blocks built into a regular 24-sided polygon 36ft across corners and 27ft high. Within it are 1,696 channels for fuel elements.

A number of factors influence the design of graphite moderators, one of the most important being the phenomenon of growth under irradiation (generally referred to as "Wigner growth"), and this is affected by the quality of graphite, the direction of grain, neutron bombardment and temperature, and in turn leads to careful consideration of the design of individual blocks. The production of the graphite itself has been the subject of intensive study, and quality varies between the outer perimeter and the centre.

The patents involved, which also include details of fuel element support, are: No. 784291 and No. 784292 (now open for inspection) and No. 785876 (open for inspection from 6th November). Specifications may be obtained from the Patent Office (Sales Branch), 25, Southampton Buildings, W.C.2, at 3s 6d a copy, including postage.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

The Brush Group announces that **Mr. P. H. W. Everitt,** M.I.Mech.E., M.I.P.E., works manager, and **Mr. A. J. Haselfoot,** M.A.(Oxon.), A.M.I.E.E., chief design engineer of Fuller Electric, Ltd., have been appointed to the board of that company, and **Mr. D. N. Dow,** B.Com., C.A., A.C.W.A., lately company secretary, Mirrlees, Bickerton & Day, Ltd., has been appointed company secretary of Fuller Electric, Ltd. **Mr. L. Berry,** A.C.W.A., has been appointed company secretary of Mirrlees, Bickerton & Day, Ltd.

The Minister of Power has appointed **Mr. A. R. Cooper,** M.Eng., M.I.E.E., M.Inst.F., M.R.I., to be a full-time member of the Central Electricity Generating Board. **Mr. R. R. B. Brown,** B.A., B.Sc., M.I.E.E., chairman, Southern Electricity Board, and **Mr. T. M. Ayres,** M.I.E.E., chairman, North Eastern Electricity Board, have been appointed to fill the two existing vacancies for Area Board chairmen to serve as members of the Central Electricity Authority until 31st December next.

Mr. A. R. Cooper

Mr. Cooper was educated at Rotherham Grammar School and Sheffield University, and the early years of his career were spent in the coal mining and engineering industries. In 1928 he was appointed chief electrical engineer to Pearson & Dorman Smith in the Kent coalfield, leaving in 1934 to become personal and technical assistant to Mr. G. A. Mower, governing director of a large number of engineering firms.

In 1935 Mr. Cooper joined the Central Electricity Board as chief control engineer for the North West England and North Wales area. From 1937 to 1942 he was chief assistant to the chief operation engineer to the Board and after two years as operation engineer for the South East England area he became the Board's chief operation engineer. On the nationalisation of the industry in 1948 he was appointed controller of the Merseyside and North Wales Division. Also in 1948 Mr. Cooper won the John Hopkinson Award of the Institution of Electrical Engineers for his paper "Load Dispatching, with special reference to the British Grid System." In 1952, this paper received the Willans Premium which is awarded once every six years by the I.E.E. Mr. Cooper left Merseyside to become controller of the North Western Division in January, 1952, and when this Division was amalgamated with the Merseyside & North Wales Division in April, 1954, he became controller of the new Division.

The B.B.C. has awarded two research scholarships, valued at £435 per annum, to university graduates in electrical engineering, giving them the opportunity to work for a higher degree at any university in the United Kingdom. The first is to **Mr. J. B. Izatt,** who graduated at Aberdeen University with a 1st class honours degree in electrical engineering. Mr. Izatt will conduct his researches at Gordon's Technical College under the guidance of Dr. E. Wilkinson and Mr. A. M. Hardie. The second scholarship has been awarded to **Mr. W. A. G. Voss,** who graduated at Queen Mary College, University of London, with a 2nd class honours degree in electrical engineering. Mr. Voss will conduct his researches in the Department of Electrical Engineering at Queen Mary College under the guidance of Professor M. W. Humphrey Davies.

The Consolidated Pneumatic Tool Co., Ltd., has appointed **Mr. G. M. Keightley** as manager of its British sales division with **Mr. R. E. Bayliss** as assistant manager. Mr. Keightley was formerly manager of the company's branch in Manchester and Mr. Bayliss has been manager of the Leeds office since 1946.

Mr. J. Reekie, B.Sc., Ph.D., A.M.I.E.E., F.R.S.E., has been appointed chief engineer to Semiconductors, Ltd., Ilford, Essex. For the last twelve years Dr. Reekie has been in Canada, where he was Professor of Physics at the University of Toronto, and later head of the Department of Physics at the Royal Military College of Canada. Before joining Semiconductors, Ltd., he was research director in semiconductors and solid state physics for the Northern Electric Co., Montreal. Dr. Reekie has been responsible for a considerable number of technical publications in the field of solid state physics.

Dr. J. Reekie

The British National Committee for Non-Destructive Testing will be sending a delegation of three members to the Second International Conference on Non-Destructive Testing to be held in Chicago during November. This delegation will be led by **Dr. L. Mullins,** representing the Society of Non-Destructive Examination and manager of the Technical Advisory Department of Kodak, Ltd. The other members of the delegation are **Mr. C. C. Bates,** representing the Institution of Production Enginers and technical director of Welding Supervision, Ltd., and **Dr. J. Thewlis,** assistant head of the metallurgy division of the Atomic Energy Research Establishment at Harwell.

Mr. R. L. Webster, chief personnel manager of Hoover, Ltd., has been elected president of the Institute of Personnel Management.

Mr. H. Orchard, M.M. and Bar, M.I.E.E., M.I.Mar.E., has retired from the British Thomson-Houston Co., Ltd., Rugby, after forty-five years' service.

Mr. H. Orchard

Mr. Orchard was educated at Lawrence Sheriff School, Rugby, and afterwards studied at Finsbury Technical College (now City and Guilds) where he gained his diploma in electrical engineering. He joined the B.T.H. Co. at Rugby as a test apprentice in 1909 and after serving in the Royal Engineers in the 1914-18 war he went to Siemens (Stafford) but in 1921 returned to the B.T.H. Co. as a design engineer in what was then known as the D.C. Engineering Department. For many years he has been engaged on the design of large d.c. machines, particularly for marine drives. Mr. Orchard worked on the design of d.c. motors and generators for such well-known ships as the *Queen Mary* and *Queen Elizabeth,* and more recently he designed the 7,000 h.p. propulsion equipments for six Russian ice-breakers. He will continue to reside in Rugby.

Mr. A. H. Cartwright has resigned from the boards of Vent-Axia, Ltd., and its wholly-owned subsidiary Axia Fans, Ltd.

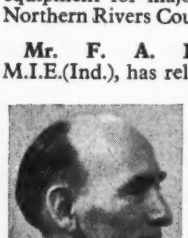
The Midlands Electricity Board has announced that **Mr. L. R. Ryder,** A.M.I.E.E., Cannock district engineer, has been seconded to the Government of Malta for a two-year tour of duty as development engineer with the Malta Electricity and Water Department. Mr. Ryder began his career in the electricity supply industry in 1934

as an apprentice with the former Cannock U.D.C. Electricity Department, later becoming mains assistant. From 1940 to 1945 he was assistant engineer with the outside contracts department of Siemens Bros., Woolwich, returning to Cannock after the war. He was appointed district engineer at Cannock in 1951.

Mr. E. W. B. Thorncroft, whose appointment as chairman of the Electricity Authority of New South Wales and as a member of the Electricity Commission of New South Wales we recently briefly reported, has been a member of the Authority since 1947.

His early training was received with the New South Wales Government Tramways at Ultimo power station, and after service in the 1914-18 war he became resident engineer with the Sutherland Shire Council. He has since held the positions of chief electrical engineer, Baulkham Hills Shire Council, electrical engineer-manager, Lismore City Council, engineer-manager, Maitland City Council, and chief electrical engineer, Northern Rivers County Council. He has acted as consulting engineer to several local government undertakings and has served on a number of committees relating to public electricity supply. In 1955 he went overseas to examine and deal with several large contracts relating to generating and transmission equipment for major projects for the Northern Rivers County Council.

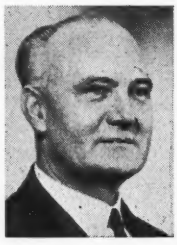
Mr. F. A. Drake, M.I.E.E., M.I.E.(Ind.), has relinquished the post of chief engineer and manager of the Gourepore Electric Supply Co., Ltd., West Bengal, and has been appointed senior electrical engineer to the Government of the Sudan Republic. Mr. Drake takes up his new duties at the beginning of November, up to which time his address will be 77, Leigham Court Road, London, S.W.16.



Mr. F. A. Drake

At the recent annual general meeting of the **British Internal Combustion Engine Research Association** the Viscount Falmouth was re-elected president of the Association. Sir Harold Roxbee Cox and Professor O. A. Saunders were re-elected as vice-presidents. Vice-Admiral N. E. Dalton (Engineer-in-Chief of the Fleet), Mr. H. N. Pemberton (chief engineer surveyor, Lloyd's Register of Shipping) and Brigadier S. A. Stewart (director, Royal Engineer Equipment, Ministry of Supply) were also elected as vice-presidents. Mr. B. D. Giordan and Mr. C. G. Tangye were elected to the Council in succession to Mr. J. Calderwood and Mr. V. H. Hopkins. Mr. A. C. Yeates has succeeded Mr. G. W. Bone as chairman of Council, and Mr. Giordan has been elected vice-chairman.

Mr. G. O. McLean, M.Eng., A.M.I.E.E., who writes elsewhere in this issue on "District Heating," was educated in India and Liverpool University, followed by a varied career in the electrical industry. After training with the Liverpool Corporation and Mather & Platt, Ltd., he became assistant engineer with Lister Drive. In 1925 Mr. McLean became station engineer in Calcutta and at the same time was an honorary lecturer and external examiner in electrical engineering at Calcutta University. In 1933 he became maintenance engineer at Sculcoates power station, Hull, and the following year personal assistant to the city electrical engineer. In 1937 he went to Ealing as deputy borough electrical engineer, and thence he was in charge on the engineering section of a Dutch exporting firm. After six years with Edmundson's he became chief engineer of the South Western Electricity Board in 1948. Last year Mr. McLean set up his own engineering and industrial consultant's practice in the south west.



Mr. G. O. McLean

The following officers have been elected by the various electrical societies in Scotland:—

Edinburgh Electrical Society: President, Mr. L. E. J. Green, B.Sc.(Eng.), A.M.I.E.E.; vice-president, Mr. J. A. Hunter, B.Sc., A.M.I.E.E.; hon. secretary, Mr. J. C. Adam.

Electrical Society of Glasgow: President, Mr. J. M. Mitchell, B.Sc., A.M.I.E.E.

Paisley Association of Electrical Engineers: President, Mr. J. S. Craig; vice-president, Mr. D. Maclachlan; hon. secretary, Mr. W. McVey.

Kilmarnock & District Electrical Society: President, Mr. R. Allan; vice-president, Mr. W. Linton; hon. secretary, Mr. J. C. Andrew.

Motherwell and Wishaw Electrical and Mechanical Society: President, Mr. A. K. Nuttall; vice-president, Mr. D. A. Thomson; hon. secretary and treasurer, Mr. J. Buchanan.

Mr. I. A. A. Macdonald, has been elected chairman of the Nottingham Centre of the Illuminating Engineering Society.

The **Birmingham Electrical Golfing Society** recently held its autumn meeting at Copt Heath Golf Club, near Birmingham. At the dinner which followed the presentation of the prizes was made by the president, Mr. J. Walker, supported by the captain, Mr. W. Horrocks. Mr. G. Ireland (holder) and Mr. J. T. Aitken tied for first place, and Mr. Ireland was declared the winner of the spring trophy with the better last nine holes and retains the trophy for another year. Other prize winners included Messrs. W. Horrocks, T. C. Beaumont, J. Walker and E. R. Badmin.

The Manchester and District Branch of the **Electrical Industries Benevolent Association** recently held a draw at which the following prizes were given:—1st prize: Holiday in Switzerland for two people (value £100). 2nd prize: Week-end in Paris for two people (value £50). 3rd prize: Tour of the south coast of England (value £40).

Mr. H. Horrocks and **Mr. P. Rose** have been appointed directors of Ward & Goldstone, Ltd. Both joined the company in October, 1935.

Mr. N. A. H. Stacey, author of the article "Britain and the New European Trading Pattern" in this issue (p. 702), was born in 1920 and educated abroad and at the Universities of Birmingham and London. After working in industry during the war, he joined the editorial staff of the *Financial News* in 1944. In 1946 he was appointed assistant secretary of the Association of Certified and Corporate Accountants in charge of research and edited the *Accountants' Journal.* His work in the field of economics and accountancy brought him in 1951 the Smith-Mundt senior research award given by the United States Government. He was visiting scholar at the Graduate School of Business, Columbia University, New York, engaged in lecturing and research work, until 1953.

Mr. N. A. H. Stacey

On returning from the United States Mr. Stacey was assistant editor of *The Director.* In 1955 he joined the General Electric Co., Ltd., and is the head of its Economic and Marketing Research Unit.

Mr. Stacey has written extensively on economic, accounting and educational subjects on both sides of the Atlantic and has lectured at various universities in the United States. He is the author of "English Accountancy 1800-1954—A Study in Social and Economic History."

Mr. N. F. Gadsdon, M.C., has retired from the post of manager of the Bournemouth Sub-Area of the Southern Electricity Board. He has had forty-eight years' service in the electricity supply industry, having joined the County of London Electric Supply Co., Ltd., in 1909. He was appointed assistant secretary, County

Mr. R. R. B. Brown (left) making a presentation to Mr. N. F. Gadsdon on his retirement

of London group of companies, in 1921, and after holding positions with the various companies in the group, became regional manager, Bournemouth group of companies, being appointed a director of the Bournemouth & Poole Electricity Supply Co., Ltd., the Blandford Forum & District Electric Supply Co., Ltd., and the Milford-on-Sea Electric Supply Co., Ltd., in 1943. He was appointed manager, Bournemouth Sub-Area, Southern Electricity Board, in 1948.

At a presentation ceremony held at Bournemouth on 26th September Mr. R. R. B. Brown, chairman of the Board, presented Mr. Gadsdon with a gold wrist watch, a Murphy v.h.f. radio set and a bound parchment volume containing the names of all those who had contributed towards the gifts. The ceremony was attended by over 300 people.

Mr. Gadsdon left a few days ago for a tour round the world when he will visit Australia, New Zealand and Fiji, returning *via* Honolulu and Vancouver.

Mr. P. B. Etheridge, director and secretary designate of the Electrical Wholesalers' Federation, has left for the United States as one of two British members nominated by the Board of Trade to an E.P.A. Mission. During their six weeks' visit the team will study American wholesale trade association activities and the latest developments in distribution.

Incredible as most farces, "Love's a Luxury," by Guy Paxton and Edward V. Hoile, proved an excellent vehicle for the talents of the **G.E.C. Dramatic Society.** Two performances were given last week at the Cripplegate Theatre, London, E.C., to audiences rather depleted by the current epidemic. At the risk of being invidious, we must make special reference to the performance of Frederick Coker as "Mr. Mole"; but all did well and kept the play going at a good pace. The other players were Shirley Linge, Michael Hobbins, Raymond Pepper, Muriel Ludden, Paul Sproxton, Gillian Champion and Pamela Wilkinson. The producers were Roy Appleby and Florence Scantlebury.

The Midlands Branch of the **Electrical Trades' Commercial Travellers' Association** held a smoking concert at the Crown Hotel, Hill Street, Birmingham, recently which was attended by a large number of members and friends. The branch chairman, Mr. C. J. Nash, presided.

In accordance with its usual custom the Scottish Section of the **Electrical Wholesalers' Federation** invited the Council to hold one of its meetings in Scotland, and this annual function was held at North Berwick during the week commencing 30th September. Apart from the Council, the Scottish members invited the Councils of the Electric Lamp Industry Council and the Rubber and Thermoplastic Cable Manufacturers' Association and a number of representatives of kindred associations. The E.W.F. Council meeting was held on 2nd October and a representative number of Scottish members took advantage of the Council's invitation to attend part of the meeting and join in the discussion. A golf competition held on Thursday attracted a strong entry.

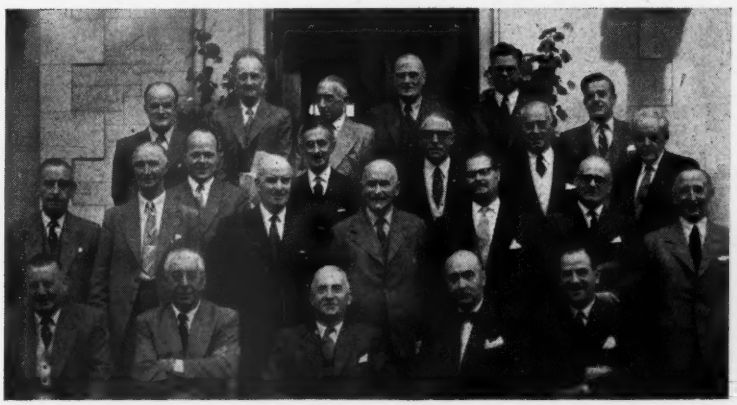
At the dinner on Thursday, Mr. A. Baillie, chairman of the Scottish Section, presided and proposed the health of the guests, to which Mr. H. S. Wathes, president of the E.C.A., responded. The toast of the ladies was proposed by Mr. C. H. Blackburn, president of the E.W.F., and Mrs. A. E. Page responded. The toast of the chairman was proposed by Mr. I. Sclar and the chairman, Mr. Baillie, replied. This was the last Scottish function which Mr. A. B. Wildsmith, director of the E.W.F., would be attending before his retirement in 1958 and the Scottish members presented him with a plaid rug. Mrs. Wildsmith was presented with a brooch. The evening terminated with dancing in the true Scottish tradition.

On Friday last the **Faraday House Old Students' Association** held its annual dinner at the Savoy Hotel, London, under the chairmanship of Mr. W. D. H. Gregson. The toast "Faraday House" was proposed by Mr. T. E. Goldup, C.B.E., President of the Institution of Electrical Engineers. He said he had looked forward to the occasion, not as President of the I.E.E. but because he had sat in judgment on Faraday House Examination results. Everyone in the I.E.E. had an interest in the College. Mr. Goldup went on to say that things were changing fast in the field of education and that among the things Faraday House should look closely at were the equipment, the staff and the standard of training. He wished the Principal, Mr. G. H. Randolph Martin, every success and hoped that Faraday House would not only produce presidents of the I.E.E. but engineers who could keep the country ahead in the world's engineering development.

The response was made by Sir Vincent Z. de Ferranti, M.C., M.I.E.E., who said that in 1882 there was also a dearth of qualified engineers in power stations. His father, he said, conceived a scheme to build a power station at Deptford and amongst the developments was the installation of a high voltage paper insulated cable. Sir Vincent said that it was at about this time that Faraday House College was founded in order to produce qualified electrical engineers. The success of Faraday House had been well proven by the number of men who had risen to important positions in the electrical industry.

The chairman, who proposed the toast of the guests, referred to the

E.W.F. Council and Scottish members at North Berwick. Front row (left to right): Messrs. J. Kinlock, H. Riley, C. H. Blackburn (president), A. Baillie and T. S. Weston. Second row: Messrs. G. W. Cartwright, J. M. Milne, R. E. Silvey, J. W. E. Rutherford, F. J. Blackwell, C. H. Marr and E. H. Stein. Third row: J. Aikman, jun., J. Kerr, T. D. Woods, L. B. Burn and A. B. Wildsmith (director). Fourth row: Messrs. F. Dunnet, T. T. Young, W. Yuille, J. A. Aikman, P. B. Etheridge (director designate) and J. McNeilage



tendency towards specialisation and said he felt a broader outlook was needed. The art of delegation should be practised more and those to whom responsibility had been delegated should have the backing of those in authority. The reply was made by Mr. W. H. McFadzean, C.A., Companion I.E.E.

Nearly 700 attended the annual dinner and dance of **W. T. Henley's Telegraph Works Co., Ltd.,** which was held at the Dorchester, London, W.1,

Dr. P. Dunsheath speaking at the Henley's staff dinner

on 12th October. The gathering included branch managers and staff from branches throughout the British Isles, in addition to the management and staff from the company's head offices and works.

After dinner, Mr. W. A. Lishman, chief buyer, who has completed 50 years' service with Henley's, proposed the toast of "The Henley Companies," to which Dr. P. Dunsheath, C.B.E., a director, who was chairman for the evening, responded. Dr. Dunsheath, in his reply, took the opportunity of welcoming Henley's new director, Sir Alexander Sim, who was attending the function for the first time.

Mr. A. S. Brewer, advertising manager, proposed the toast of the ladies in an amusing speech referring to the number of ladies present who had completed twenty, thirty, and even forty years' service with the company. This toast was admirably responded to by Miss C. M. Allen, secretary to the Woolwich works manager. After the speeches there was dancing and a cabaret.

Mr. H. C. Exell, M.Sc. (North Thames Gas Board) has been elected president of the Purchasing Officers' Association for 1957-58.

OBITUARY

Mr. J. P. McKenzie.—The death occurred on 9th October at Torquay of Mr. James P. McKenzie, M.C., chairman and managing director of the Sifam Electrical Instrument Co., Ltd.

Mr. B. W. Livermore, a director of Keith Blackman, Ltd., died on 7th October. Mr. Livermore, although in his 72nd year, was still a very active member of the board, which he joined in 1948, and before his retirement as a full-time executive in 1955 had served the company for fifty-one years.

Mr. Harold Hirst, managing director of Johnson & Co. (Bradford), Ltd., electrical engineers, of Birkenshaw, died suddenly on 6th October at the age of sixty-four.

Mr. F. D. Parker, A.M.I.E.E., on the commercial staff of the Wear Sub-Area of the North Eastern Electricity Board, died recently at the age of forty-eight. Mr. Parker was educated at Ellesmere School and Bishop Holgate School, York, and was formerly associated with the Barnsley electricity undertaking and was for many years with the North Eastern Electricity Supply Co. before nationalisation.

Contract Price Formulæ

The British Electrical and Allied Manufacturers' Association has issued the figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 11th October is deemed to be 186s 6d.

The "costs of materials" figures are: For electrical machinery and equipment the Board of Trade index figure published on 11th October is 180·7. For turbo-generating and allied plant: Materials used in mechanical engineering industries 187·4, blast furnaces and iron and steel melting and rolling (40 and 41) 192·3. The price of ¾in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin,* 11th October) is 42⅞d per lb.

Mr. J. S. Maclay, Secretary of State for Scotland, opening the Barony power station, Ayrshire (see *page 731*). *On his left is Mr. J. S. Pickles, chairman of the South of Scotland Electricity Board, and on the left of the picture is Mr. J. Henderson, the Board's chief engineer*

Convention Exhibition

There are indications that the decision of the Council of the British Electrical Power Convention not to organise an exhibition at Brighton next year may not be final. The Council has always regarded the exhibition as an integral part of the Convention—an added attraction and a rendezvous for delegates. It is accordingly approaching last year's exhibitors to ascertain whether they are in favour of an exhibition at the 1958 Convention or not. Those who are not in favour are being asked whether, if the majority desire an exhibition, they will support it.

Apprenticeship in the Electrical Contracting Industry

The Ministry of Works announces that the scheme of registration of apprentices in the electrical contracting industry, initiated in 1950 and administered by the Apprenticeship and Training Council, will be terminated on 30th November. After that date no further applications for registration should be submitted.

PRICES OF MATERIALS

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £197 0s 0d
COPPER, H.C. Electro	ton £183 0s 0d
Fire Refined 99·70%	ton £182 0s 0d
Fire Refined 99·50%	ton £181 0s 0d
COPPER Tubes ..	lb 1s 9½d
Sheet	ton £212 5s 0d
H.C. wire and strip ..	ton £234 5s 0d
LEAD, English ..	ton £84 15s 0d
Foreign	ton £83 0s 0d
MERCURY	flask £75 0s 0d
TIN, block (English) ..	ton £730 5s 0d
ZINC, G.O.B. Foreign	ton £67 15s 0d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 1s 6d
Sheet	ton —
Wire	lb 2s 3½d
PHOSPHOR BRONZE Wire	lb 3s 7⅞d
PLATINUM	oz £31 0s 0d
RUBBER, No. 1 R.S.S. spot	lb —

I.E.E. SUB-CENTRE CHAIRMEN

THE Sub-Centres of the Institution of Electrical Engineers have grown in status since they were first formed, and now many of them vie with the Centres in importance. Following the biographies of the Centre chairmen in previous issues, we now give brief details, together with the portraits of the men who will lead the activities of the Sub-Centres during the 1957-58 Session.

Mr. H. G. Cope, A.M.I.E.E. (*North Lancs.*) is area engineer in the Preston Telephone Area of the General Post Office. He entered the Post Office Engineering Department in London in 1919, and in 1932 was transferred to the Post Office Central Training School at Dollis Hill, where he was engaged on training duties, including lecturing on automatic telephone exchange systems. In 1939 he was appointed chief inspector in the Leeds telephone area, being promoted to assistant engineer and transferred to the Liverpool area in 1942 where he was engaged on the maintenance of manual and automatic telephone exchange systems. He was seconded to the Foreign Office for service in Germany in 1946 and returned to the Post Office in 1948. He took up his present position at Preston in 1951 and is responsible for the installation and maintenance of the Post Office internal and external telecommunications plant in the area.

Mr. O. I. Butler, D.Sc., M.I.E.E., M.Amer.I.E.E., A.M.I.Mech.E. (*Sheffield*) is Reader in Electrical Machinery at the University of Sheffield. Although his early training was in the mining industry he subsequently studied electrical engineering at University College, Cardiff, and graduated with 1st class honours and was Page Medallist in 1933. He received his post-graduate training with the Metropolitan-Vickers Electrical Co., Ltd., followed by a period in the mining section of the Industrial Design Department. His appointment as lecturer at the University of Liverpool in 1936 was interrupted from 1940 to 1942 by service at the Royal Aircraft Establishment, Farnborough. He was subsequently a senior lecturer at the University of Liverpool, and in 1948 succeeded Dr. T. F. Wall as head of the Electrical Engineering Department of the University of Sheffield, in which post he planned the extensions to the Department which were opened earlier this year by Sir Harold Bishop. Dr. Butler is the author of a number of papers on electrical machinery published in the *Proceedings* of the I.E.E. and *Transactions* of the American I.E.E., and he has also published several papers on the performance characteristics of electrical sheet steel. His first technical paper was "Cattle and Electric Shock," published in the *Electrical Review* in 1936.

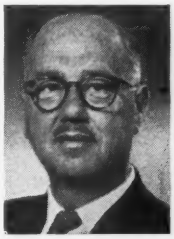
Mr. D. G. Furneaux, B.Sc.(Eng.), A.M.I.E.E. (*Tees-Side*) received his training at Faraday House Electrical Engineering College, taking an external engineering degree at London University. He spent three years with the London Power Co. as a junior protective gear engineer. During the war he was for eight months in the R.A.S.C. and for four years in the R.A.F. Most of the time in the R.A.F. was spent at Boscombe Down carrying out service acceptance trials, and he held the rank of flight lieutenant. For the past ten years Mr. Furneaux has been with Imperial Chemical Industries, Ltd., at its Wilton Works, which he joined as a design engineer, and where he is now senior electrical engineer.

Mr. H. G. Cope

Dr. O. I. Butler

Mr. D. G. Furneaux

Mr. J. Mendelson, M.I.E.E. (*South-East Scotland*) was educated at Monterrey (Mexico), Berlin, Amsterdam and London, and took an electrical course at the Regent Street Polytechnic. He served a three-year indentured student-apprenticeship with the British Thomson-Houston Co., Ltd., at Rugby and Willesden and subsequently had experience with Standard Telephones & Cables, Ltd., before being engaged as electrical engineer on the Shannon scheme construction for Siemens-Schuckertwerke, with whom he later spent six months in Berlin on power plant tendering for export. He joined Ferranti, Ltd., in 1929, for whom he was North Europe representative, and he was later appointed technical representative of the company for Scotland and Ireland, being appointed to his present position of Scotland and Ireland area manager in 1945.



Mr. J. Mendelson

Dr. A. J. Small

Prof. E. G. Cullwick

Mr. A. J. Small, B.Sc., Ph.D., M.I.E.E. (*South-West Scotland*) is senior lecturer in the Electrical Engineering Department of the University of Glasgow. He was educated at Allan Glen's School and the University of Glasgow and took a "sandwich" apprenticeship course, gaining the B.Sc. degree in 1921. His general engineering workshop training in mechanical and electrical engineering was obtained with McKie & Baxter, Govan. He has been lecturer on the staff at Glasgow University since 1927. Dr. Small has carried out research on h.v. measurements and standardising of h.v. measuring devices, for which he received his Ph.D. degree.

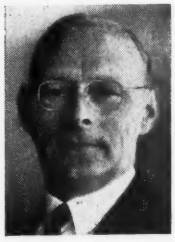
Professor E. G. Cullwick, O.B.E., M.A., D.Sc., M.I.E.E., F.R.S.E., Capt.(L.), R.C.N.(R.), retd. (*North Scotland*) is Watson-Watt Professor of Electrical Engineering in the University of St. Andrews, Queen's College, Dundee. He was educated at Wolverhampton Grammar School and Downing College, Cambridge (mathematical scholar, foundation scholar in engineering), and received a mathematical and mechanical sciences tripos, industrial bursar of the Royal Exhibition of 1851. After a period with the British Thomson-Houston Co., Ltd., and the Canadian General Electric Co. he was appointed assistant professor of electrical engineering at the University of British Columbia, Vancouver, B.C., in 1928. He returned to this country in 1934 to take up the position of lecturer in electrical engineering at the Military College of Science, Woolwich, but returned to Vancouver in the following year as associate professor of electrical engineering at the University of British Columbia. From 1937 to 1946 he was professor and head of the Department of Electrical Engineering at the University of Alberta, Edmonton, and was also (from 1942 to 1947) Director of Electrical Engineering, R.C.N. From 1947 to 1949 he was Director of the Electrical Research Division of the Defence Research Board, Ottawa. While in Canada, Professor Cullwick was vice-chairman of the Vancouver Branch of the American I.E.E. (1936-37), and he organised the Electrical Branch of the Royal Canadian Navy. He is the author of a number of technical, scientific

Mr. W. J. Carfrae

Mr. H. A. P. Caddell

Mr. G. E. Middleton

Mr. I. G. Evans


Mr. C. H. Foulkes

and educational papers, including "The Fundamentals of Electro-Magnetism," published in 1939. Professor Cullwick is Dean of the Faculty of Applied Science at St. Andrews University.

Mr. W. J. Carfrae, B.Sc., M.I.E.E., A.Amer.I.E.E. (*Rugby*) has spent the whole of his career with the British Thomson-Houston Co., Ltd., which he joined as a student apprentice. He became a member of the staff in 1927 and has since been intimately associated with the design and development of turbo-driven alternators. He became manager of the Turbine-Group Engineering Department at Rugby in 1948 and has since been responsible for all matters affecting electrical design and performance, including the first B.T.H. hydrogen-cooled alternators, and hydrogen-coolers, developed to meet the required conditions. He introduced the directly coupled double-bearing exciter with various forms of flexible drive, and he was instrumental in the introduction of the use of the "d.c. current transformer" for measurement of alternator field current. Mr. Carfrae also investigated conditions of exciter and slipring brush-gear and instituted modified designs resulting in improved performance. He visited the United States in 1946 to study hydrogen cooling practice on alternators and again this year to study current steam turbine practice. Last year he was assigned to special duties in connection with turbine manufacture. He is a Fellow of the Heriot-Watt College, Edinburgh.

Mr. H. A. P. Caddell, M.A., M.I.E.E. (*North Staffordshire*) is manager of the North Staffordshire Sub-Area of the Midlands Electricity Board. He received his education at Wellington College and Caius College, Cambridge, where he gained an honours degree in natural science. After serving an apprenticeship with the Shropshire, Worcestershire & Staffordshire Electric Power Co. he entered the service of the company as district manager at Dudley and subsequently held the successive positions of commercial assistant, head office (1933-36), district manager, Evesham (1936-39), district manager, Redditch (1939-45), and finally divisional manager, central division (1945-48). He took up his present position with the Midlands Electricity Board at vesting date. He has carried out a number of investigations in connection with load analysis and was a member of the E.R.A. Sub-Committee on General Load Research and of the E.D.A. Central England Area Committee. In North Staffordshire he has been connected with the development of the pottery firing load.

Mr. G. E. Middleton, M.A., M.I.E.E. (*East Anglian*) has been University Lecturer in the Department of Electrical Engineering in Cambridge University since 1948. His student days were spent at the Manchester College of Technology and Emmanuel College, Cambridge. After an apprenticeship with the British Thomson-Houston Co., Ltd., and a year in America for the company as a fellowship student, he was with the company for eighteen years as a designer of electric motors. Mr. Middleton is a Fellow of Downing College.

Mr. I. G. Evans, A.M.I.E.E. (*West Wales* (*Swansea*)) was educated at the South Wales and Monmouthshire School of Mines, Treforest, and received his training with Insoles, Ltd., Porth, Rhondda. In 1925 he joined the Rhondda U.D.C. Electricity Department, and remained there until 1940, finally holding the position of works and power station superintendent. He left Rhondda to become electrical engineer and manager to the Portland U.D.C., and in 1946 took up a similar position with the Pontypridd U.D.C. At vesting date he was appointed local representative at Pontypridd, and in September of the same year was transferred as district commercial manager of the newly formed Swansea and Gower District of the South Wales Electricity Board, subsequently taking up his present position of sub-area commercial officer of the West Central Sub-Area of the Board, with headquarters at Swansea.

Mr. C. H. Foulkes, M.I.E.E., A.M.I.I.A. (*South-Western*) was educated at the Borough Polytechnic, London, and Harvard Business School, Boston, Mass., U.S.A. He joined Standard Telephones & Cables, Ltd., in 1936, and has held the successive appointments of assistant, valve laboratory (1936-40), valve engineer (1940-43), section head, valve laboratory (1943-48), department head, valve laboratory (1948-54), and is now location manager for the company at Paignton.

Industrial Expansion in Madras

THE latest report received from the Madras Government Electricity Department (Chief Engineer for Electricity, Mr. V. P. Appadurai) covers the year 1955-56 which brought to a close the first national five-year plan period. It records a continued increase in the demand for power for industrial and agricultural purposes.

Capital expenditure on new projects and extensions totalled Rs.11 crores (£8¼ million), a record figure for the present Madras State. Preliminary work in connection with the Kundah hydro-electric scheme, the biggest yet undertaken by the Department, was put in hand during the year though the actual project is included in the second five-year plan. The scheme will have an installed capacity of 180 MW. It is being carried out with Canadian aid under the Colombo Plan and is expected to be completed by the end of 1960. This and other extensions in the second five-year period will more than double the Department's installed capacity but even so there is likely to be a power deficit by 1964-65. It is hoped to obtain 130 MW for the State grid from a thermal station proposed to be constructed in the Neyveli lignite region.

A total of 1,054 million kWh was generated or purchased in 1955-56, 13 per cent more than in the previous year, mostly produced in hydro-electric stations. At the end of the year there were 421,500 consumers in areas served by Government undertakings, of whom some 240,000 received their supplies directly from the Electricity Department.

New bulk supplies to be provided include 3,000 kW in 1958-59 for an electric train service from Tambaram to Villupuram (and up to 8,000 kW in the next ten years); an additional 3,500 kW for two cement factories; and 3,000 kW for a State-owned paper mill at Nilgiris. The Government Metals Directorate is considering the establishment of an aluminium industry requiring a firm supply of 20,000 to 30,000 kW, and there have been inquiries for large power supplies for the manufacture of soda ash and heavy chemicals.

Vitreous Enamel Development

New Advisory Service Opened

ACCORDING to the recently formed Vitreous Enamel Development Council, there has in the past been much ill-informed criticism of enamel, the main reason being the almost complete ignorance of the general public, and some manufacturers, as to the meaning of an "enamel" finish. It is the object of the Council to ensure that the public and industry fully understand the difference between imitation and real enamel and for this reason they extended an invitation last week to the Press to visit the works of two domestic appliance manufacturers who are concerned with vitreous enamel and its application to their products.

Briefly, the term vitreous enamel implies the fusion of glass on metal. In fact it is a true glass, a complex chemical substance made by melting together at very high temperatures (1,100-1,200 deg C) many inorganic substances, most of which are present in, and derived from, igneous and similar natural substances of great age and permanence. Such ingredients include quartz, felspar, fluorspar, cryolite, ilmenite and many others. When these ingredients are melted together a glass of special quality is produced. This glass is known as "frit" and is, in fact, vitreous enamel before it has been milled, having a glossy surface similar in appearance to crushed glass.

After it has been milled, it is applied to the articles by being melted on to the surface, giving a complete layer over the metal with the smoothness and hardness of glass, but being incapable of burning or charring when heated. In all cases the finish is resistant to household acids.

The first factory visited was that of Belling & Co., Ltd., manufacturers of electric cookers and fires. Here the vast majority of products are manufactured from sheet steel as opposed to cast iron. Once a component has been cut and pressed into shape, it is thoroughly treated in an automatic steel pickling and cleaning plant. The enamel is prepared in the mill room in a number of large grinding mills where the enamel frit is finely ground with water, clay and inorganic colouring materials as required.

Coating of Metal Parts

After the sheet metal parts have been cleaned and dipped and fired in ground coat, they are sprayed with cover enamel. The parts are then moved into a drying oven and afterwards covered with a finely-ground, powder-like substance. They are then placed into a furnace for firing or fusing. As the component parts move through the furnace they attain a temperature of about 800 deg C and the enamel is melted on to the steel, whereupon it becomes completely fused, forming not just a protective coating, but combining to become one material.

At the second factory, that of R. & A. Main, Ltd., similar processes were seen, but in this case the products manufactured were gas cookers, water heaters and electric refrigerators. This company, however, have their own frit plant and the opportunity was afforded to observe the manufacturing process.

First, the stored inorganic materials used are examined and analysed to ensure uniformity of the finished enamel. The weighing and batching machine ensures that each batch of materials when charged into the furnace will give the desired product.

After being subjected to a very high temperature for several hours, the molten glass is poured off into water which cools it and renders it suitable for subsequent grinding in the enamelling process. It is collected from the water tank and dried, when it has the appearance of a rather coarse crushed glass. The frit for use on cast iron is different from that made for steel but the principle of manufacture is the same throughout.

It is understood that both manufacturers have expended large sums of money in installing the complex enamelling plants, and in establishing the processes and training technical staff.

Subsequently to the visit to the factories the Council announced the setting up of a new Enamel Advisory Service for the general public, and for industry, the object of which will be to deal with the many problems encountered with protective coatings and finishes on domestic and industrial products. All inquiries should be directed to the Council at 11, Ironmonger Lane, London, E.C.2 (telephone, Monarch 8888). A special service is also available to manufacturers who desire to have information regarding the possibility of finishing any of their products in real vitreous enamel.

Australian News

CONSTRUCTION of a second major power station in the Snowy Mountains scheme is to begin soon. The Minister for National Development, Senator Spooner, stated recently that tenders were to be called immediately for the construction of this station (T2) on the Tumut River. This, he said, would mark the beginning of the second phase of the upper Tumut development plan, and about 1,200 men would be employed for at least three years.

But the Snowy Mountains project is not without its critics. The Authority's borrowing rate has now risen from the £3 2s 6d per cent of 1950 to £5 1s 9d per cent, and it is stated that this alone would have eliminated the margin between the Snowy hydro power and thermal power if the Authority had not made considerable alterations to the plans of layout and operation of the scheme.

The Snowy scheme is, of course, a huge one for the size of the nation. It would be a big project even for the United States, and in capital-scarce Australia there must be very good reasons for spending an extra £200 million to get electricity from water instead of from coal. As one financial authority points out: "Capital projects of slow fulfilment are inflationary; £80 million has so far been spent on Snowy in return for only a trickle of power."

The Snowy project was authorised eight years ago in a period of artificially low interest rates. The Snowy Commissioner is reticent about cost estimates on the grounds that they are "technical," but there are many people who could understand such figures if they were made available. One executive says: "It is not reassuring to find that even the EBASCO report on the Snowy project has not been made public."

The Western Australian State Electricity Commission is issuing a loan of £750,000 with interest at 5¼ per cent for six years or 5¾ per cent for 10 or 20 years.

ENGINEERS AND SERVICE

Chairman's Address to the I.E.E. Utilisation Section

IN his chairman's address, "Joints and Hinges of the World," to the Utilisation Section of the Institution of Electrical Engineers in London on 10th October Mr. J. Vaughan Harries considered the non-technical duties of an engineer and ranged over many facets of the social responsibility of the engineer to the community, taking for his inspiration the words of John Davidson:

"Nameless as the stars of night,
Far in galaxies unfurled,
Yet we wield unrivalled might,
'Joints and hinges of the world.'"

Engineers should try to serve engineering in the best possible capacity and to take every opportunity, through service to the community, to emphasise their usefulness to mankind. Service was a really live issue, said Mr. Harries, who voiced the general appreciation of I.E.E. members of a recent editorial in the *I.E.E. Journal* which dealt with the duties of members to the public and the desirability of all those who are qualified being known as "Chartered Electrical Engineers."

Engineer's Attributes

Mr. Harries asked how a young chartered engineer could engage himself to give of his best and at the same time to play a full part in the national life, and said that engineers should become "joints and hinges to a greater and more comprehensive social responsibility." Some of the attributes and activities the engineer should cultivate were: a respect for the arts and humanities; a keen social regard; a deeper appreciation of the Press; and a studied use of broadcasting by giving talks, and taking part in documentary broadcasts.

Fairly recently, he said, Lord Chandos "warned engineers that the humanities must not be neglected, that the art of conveying ideas was not often possessed by scientists and mathematicians, and that when it had been the result was remarkable." That forthright statement, coming from a leader of industry, was refreshing, for in it was a release from the old accepted idea that engineers should always remain engineers.

It is a fallacy to suppose that a training in the applied sciences somehow unfitted its owner for the appreciation or performance of the arts. There had always been poets and artists and writers in the ranks of the scientists. The engineer was entitled to be well skilled in the liberal arts, and there is no reason why engineering and polite learning should not go together.

Engineers did not at present take enough interest in national and local government. There were, for example, only five chartered engineers in the House of Commons, compared with 93 barristers, 46 journalists and 36 farmers. Engineers ought to make their friends aware of their desire to serve and participate fully in the duties of ordinary citizenship.

More engineers should interest themselves in the art of conveying ideas and of speech-making. One often heard the criticism that the subject matter of a paper was good, but the paper itself had been badly written. There were probably far more good papers well written but badly delivered, Mr. Harries suggested, than there were papers originally wanting in composition. The person who undertook the task of writing an essay or paper was usually an educated man, but speech-making, unfortunately, was not usually part of his education.

Turning to public relations, Mr. Harries declared:

"It is in the field of the provincial and national Press that we require to work, because they are in contact with the general public. In the better-class newspaper, which appeals to the intellect and not to the emotions, you will always find regular features, articles, which deal with art and architecture, painting and photography, prose and poetry, music, but only rarely with engineering as a regular feature." He thought that much of the fault rested on the engineers' own doorstep because they had not developed a firm sense of relationship with the Press and as a result were just a race apart to editors and reporters. It was questionable whether the engineer had used broadcasting as fully as he might have done to spread the gospel of engineering. Mr. Harries cited the examples of several pieces of domestic electrical equipment about which many men and women would like information: for instance, the electricity supply meter, the electric clock, and the motor car ignition coil. With the use of simple apparatus, drawings and sketches in the hands of a few engaging personalities well skilled in the art of teaching there could be attractive programmes interesting to the television viewer.

The chairman said a civic trust had recently been founded for the encouragement of good architecture and this would use television programmes and exhibitions for much of its work. The Institution's Charter provided for the use of exhibitions and the Institution should adopt to the full the new means of education.

Mr. Harries ended by saying: "Therefore let us go out and get to know as many people as we can, and that soon. When the names of Faraday and Shakespeare are equally honourable in your household, then electrical engineers will have established a proper knowledge of their work. This is a grand Institution; we are proud of it; let us dedicate ourselves to the furtherance and fulfilment of its aims and objects: let us be 'joints and hinges' of the world."

Defects in Metals and Alloys

A SYMPOSIUM on "Vacancies and Other Point Defects in Metals and Alloys" is being arranged by the Metal Physics Committee of the Institute of Metals to be held at Harwell on 9th and 10th December.

On the first day there will be a visit in the afternoon to see certain aspects of research work at the Atomic Energy Research Establishment, together with a brief visit to the reactor DIDO, while in the evening there will be an introductory lecture, for non-specialists, by Prof. R. W. K. Honeycombe (University of Sheffield). The second day will be devoted to the symposium itself and the discussion will be based on a series of six papers.

The symposium will be open both to non-members as well as to members of the Institute. Attendance will be by registration only. A basic registration fee of £1 5s will be charged to cover the advance copies of papers, and lunch, coffee and tea and transport to and from Oxford or Didcot will be provided at additional cost. Details of the meeting, with registration form, can be obtained from the Secretary, Institute of Metals, 17, Belgrave Square, London, S.W.1.

DISTRICT HEATING

By G. O. McLEAN, M.Eng.

THE ECONOMICS OF JOINT GENERATION SCHEMES

THE new Electricity Act with its clause allowing Area Boards to generate under certain conditions and subject to the consent of the Minister, must once again raise the hopes of the district heating enthusiasts. It has been proved in various technical papers and is being proved daily in industrial works, where there is a reasonable balance between process steam requirements and electrical load (so that the condenser losses can be eliminated entirely), that both needs can be met in a most economical way. This fact, that national economic efficiency will be improved by combined generation and district heating, should be sufficient for an efficiency conscious Minister, such as Lord Mills, to give his consent to district heating schemes. It is proposed in this article, therefore, to examine once again the economics of district heating with an actual example.

Sizes of Plant

The economics of a district heating scheme will be largely governed by the size of units it is possible to install and operate, as well as the steam conditions and the distribution of low grade heat, but the former and the

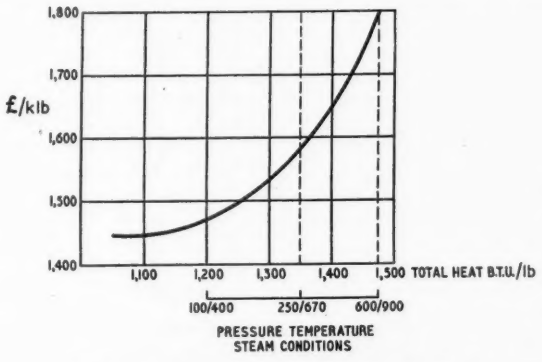


Fig. 1.—Boiler costs: variation with steam conditions

latter, to a lesser extent, will depend on the heat demands and the load factor of such demands. These in turn will depend on the building density, the area to be covered and the type of buildings in the area. Outside greater London there are approximately 20 cities or municipal authorities with populations in excess of 200,000 and areas in excess of 20 square miles and probably an equal number with areas ranging between 10 and 20 square miles.

Most of these municipalities have a central zone containing large offices, shops and public buildings (including hospitals in some cases). This zone, on an average, is not less than three square miles in extent but it may be convenient to consider areas contained within a half-mile radius of the centre of the town—i.e. 0·785 square mile and an area one mile radius from the centre, i.e. 3·14 square miles.

As the buildings in the provincial cities under consideration have not fewer than three and generally not more than six floors, it is estimated that the probable heating load of the smaller densely built area is 50 million B.Th.U./hr and for the larger area which thins out at the periphery, about 150 million B.Th.U./hr. If a single district heating generating station were contemplated for each of the hypothetical zones, then to give the heat quantities required, suitable unit sizes for turbines and boilers would be those having steam outputs of 15, 20 and 25 kilo lb for the small area and 45, 60 and 75 kilo lb for the larger area, depending on the number of units in the station.

The heat load figures are derived from the rough yardstick of 2½ B.Th.U./hr being required for each cu ft of building space centrally heated, with a temperature difference between inside and outside air temperature of 35 deg. The cubic space capable of being heated by 50 million B.Th.U./hr is, therefore, 20 million cu ft, or for an average ceiling height of 10ft, 2 million sq ft of floor area. With an average of four floors per building, this reduces to 500,000 sq ft of ground occupied by buildings which are centrally heated, out of a total of 22 million sq ft of ground area in the half-mile radius.

Boiler Prices

Having arrived at the possible sizes of boiler and turbine plant suitable for district heating schemes it is now possible to examine the economic side. As one would expect, boiler prices vary not only with the size of boiler but also with stop-valve conditions, and the amount of superheater surface to be added to the evaporation surface. As it is the stop-valve conditions (pressure and temperature) which affect the generating cost of a district heating scheme, it is only necessary to examine the variation of costs for reasonable size units that change with these conditions. In other words, most of the boiler structure will be required for a district heating scheme whether generation is combined with it or not and so generation can only rightly be debited with the increased costs due to increasing pressure and temperature at the stop valve.

Fig. 1 demonstrates how boiler prices per kilo lb vary with stop-valve conditions, plotted in total heat units. It will be noticed that the difference in price between the very low heat content value boiler and that for a medium-pressure and moderate superheat temperature boiler is about £150/kilo lb of output. As turbines operating in these moderate conditions and exhausting at atmospheric pressure have a steam consumption of about 24/25 lb/kW, the additional boiler price for adding generation to a district heating scheme would be not more than £4/kW. Similarly, if one were to consider much higher stop-valve conditions in order to obtain lower steam consumptions or higher electrical outputs for the same steam throughput the incremental boiler costs over the plant needed for a non-generating type of station would go up to £6/kW. It would be safe, therefore, to use a figure of £5/kW for additional boiler capital required for the generation side of a joint district heating/generating station.

Turbine Prices

The size of turbine plant having been fixed by the amount of low-pressure steam required for the district heating purpose, the price will vary in accordance with

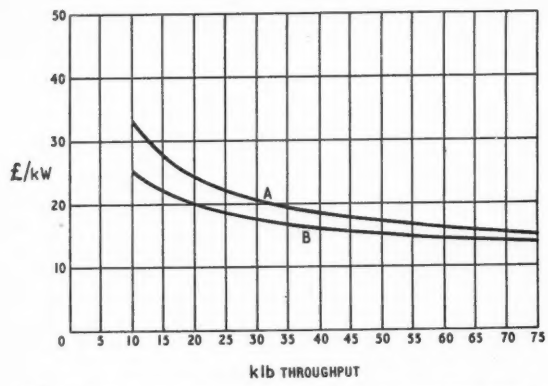


Fig. 2.—Back pressure turbine costs in relation to steam throughput. (A) Low pressure and temperature, (B) High pressure and temperature

such maximum demands and also with the stop-valve conditions and the number of expansion stages, the exhaust conditions being fixed at a reasonable pressure of, say, 5 lb/sq in. Pass-out turbines of the appropriate sizes and suitable for similar conditions are fairly standard for industrial works and prices vary, roughly as shown in Fig. 2. The characteristic of the curves is what one would expect, the price per kilowatt ranging from £15 to £30.

Cost of Distribution Pipework

Distribution of heat can be achieved by low-pressure steam pipes feeding into three or four heat-exchanging points or directly by means of hot water under pressure. Both systems have their supporters, but for the purpose of this economic exercise, size and price of water pipes have been used. On that assumption, 50 million B.Th.U./hr of total heat can be distributed with a reasonably low water velocity through 4in pipes. With the present-day price of steel and road excavation costs, flow and return pipework complete with sectional valves and heat insulation will probably be about £10 per yard. The route length of a distributing main in the small area under consideration from the centrally situated station would be half-a-mile and as many as eight radial feeders may be needed to distribute this quantity of heat. Using the usual interest and depreciation rates and an assumed load factor of 25 per cent, the cost per therm (100,000 B.Th.U.) of this part of the equipment would be about 2d.

Sale Prospects

As indicated earlier, the heating loads contemplated are roughly only 5 per cent of the maximum possible. This is on the assumption that of the 22 million sq ft of superficial area in a half-mile radius, only about 10 million would be built on. It is probable that half the buildings on the 10 million sq ft would not be suitable for or could not contemplate central heating. What would be the prospects of selling heat "on tap" to the remaining 50 per cent. The most likely participants in such a scheme would be owners of public buildings, shops and large offices; and they, of course, would only participate if the piped heat was cheaper than they had experienced with oil, gas or solid fuel fired boilers. Theoretically, none of these systems (using market prices and a reasonable boiler efficiency) should cost their users more than 12 to 18 pence per therm, but in practice the heating costs of the buildings being considered are from 15 to 30 pence per therm. It should, therefore, be fairly easy to persuade one in ten of the possible participants to sign an agreement if the piped heat price were 20 per cent below existing prices, say, 1s per therm.

Economics of Supply

The feasibility of meeting this target can now be demonstrated. Considering first the generation side alone, it is clear from the discussion above and the graphs, that the additional plant costs are only £20 to £30/kW. If generous allowances are made for additional building costs, switchgear and cables, to enable the generators to be connected to the Area Board's l.v. network, then the total capital costs for generation can be placed at £30 to £40/kW, which, when converted to an annual basis at 8 per cent, become £2·4 to £3·2/kW per annum.

The fuel costs for the steam used by the turbo-generators—even with coal at £5/ton (South Western average)—will not exceed 0·3d/kWh generated; while turbine drivers' wages, lubrication and maintenance should not bring the total running costs above 0·5d/kWh.

The total generating costs are, therefore, £3/kW plus 0·5d/kWh—or for a 25 per cent heating load factor, a flat rate cost of 0·83d/kWh which is considerably below the cost of the Board's bulk supply tariff at low-voltage network level.

The heating side of a combined scheme would find it difficult to sell at the target figure of 1s per therm if it were debited with all the remaining costs, as it has been shown above that distribution pipework would cost about 2d per therm and boiler plant, on a 25 per cent load factor basis, about 4d per therm, leaving only 6d per therm for annual charges on buildings, and the important running costs of fuel, wages and maintenance.

If, however, the Electricity Board paid £5/kW and 0·7d/kWh for all supplies fed into its network (a price still below the present bulk supply tariff) then about one-third of the annual capital charges on the plant and buildings would be met. The break-even cost for "piped" heat would then be about 9d per therm, and consequently the local authority would have a genuine "trading" undertaking, with worthwhile savings to all concerned.

Semi-Conductor Rectifiers

THE first metal rectifier was introduced in this country by the Westinghouse Brake & Signal Co., Ltd., in the late 1920's. This was the copper oxide rectifier and although it was suitable for electronic and small power applications it proved bulky for large power supplies. About ten years later the selenium rectifier was introduced. This was more compact, efficient and economic for the larger installations and equipments up to several MW capacity have been built. To-day two further rectifiers are available, germanium and silicon, which are even more compact, efficient and economic, and these will permit a.c./d.c. conversion equipment of any magnitude to be built. Thus, the electrical engineer can now select a rectifier which will meet his needs whether he is interested in microwatts or megawatts, and his only problem is to select the right type.

Last week we attended a private exhibition which the company is holding at its Chippenham works in an effort to resolve this problem. A side-by-side comparison of all types is shown in a film, literature and display of units and equipment so that the possibilities of each type can be judged. Readers will remember that in our last issue Mr. D. Ashby dealt very fully with the future of silicon, germanium, selenium and copper oxide rectifiers in the electrical industry. On the occasion of our visit to Chippenham it was announced that an agreement had been made between the company and the Westinghouse Electric International of New York to work together on semi-conductor developments.

New Zealand's Power Requirements

RELIANCE ON WATER POWER AND GEOTHERMAL STEAM

RECOMMENDATIONS for the future power supply of New Zealand are made in a report issued by a combined committee representing the State Hydro-Electric Department, the Ministry of Works and the electricity authorities.

According to the latest returns, the Dominion had a population at 1st April, 1956, of 2,175,000, of whom 99·12 were in the supply areas of electricity authorities. In 1955-56 a total of 4,748 million kWh was generated and 3,876 million kWh sold, representing 5,541 kWh per consumer or 2,183 kWh per head of the population. The maximum load for public supply in the North Island was 657·6 MW and in the South Island 299·6 MW, with annual load factors respectively of 57·7 and 54·3 per cent. Consumers numbered 699,597 of whom 605,588 were domestic. Some 58 per cent of all consumers used electricity for water heating and a similar proportion of domestic consumers had electric ranges for cooking (excluding the smaller types of cooking apparatus).

The following generating stations are at present under construction:—North Island: Wairakei (69 MW), Mercer (180 MW), Atiamuri (63 MW), Ohakuri (84 MW) and Waipapa (51 MW), a total of 447 MW. South Island: Roxburgh, Stage 2 (160 MW). The last of the North Island stations is scheduled for completion in 1961 and the Roxburgh station in 1962. The generating capacity for the whole country will then be 1,746 MW (1,133 MW in the North Island) capable of generating 8,537 million kWh a year. It is estimated that a further 893 MW will be required by 1970, when the peak load is expected to reach 2,729 MW. Prospective peak loads and installed capacities from that date are shown in the accompanying table.

Comparison of Estimated Peak Load and Estimated Installed Capacity

Year	North Island			South Island		
	Peak Load, MW	Installed Capacity, MW	Surplus or Deficiency, MW	Peak Load, MW	Installed Capacity, MW	Surplus or Deficiency, MW
1961–62	1,174	1,133	− 41	479	533	+ 54
1962–63	1,254	1,217	− 37	513	613	+100
1963–64	1,338	1,323	− 15	548	613	+ 65
1964–65	1,426	1,323	−103*	584	613	+ 29

* This deficiency could be avoided if Wairakei Stage III were available.

Dealing with hydro-electric developments, the committee considers that the construction of a 480 MW station at Benmore on the Waitaki River should be approved at the earliest possible date; that provision should be made for the construction of the Aratiatia station on the Waikato River and another station on the Kaituna River or elsewhere; and that the civil works now in hand at Atiamuri and Ohakuri should allow for an additional set in each station. Aratiatia is the one remaining source of power on the Waikato River, which already supplies a great deal of the country's power. It could produce 60 MW at a capital cost of about £80/kW and the committee strongly recommends that construction should be put in hand so that power will be available in 1964. It appreciates that public protests are likely on amenity grounds but feels that the scheme is essential if a power shortage is to be avoided. While the Huka Falls would be preserved, the committee says it must be recognised that for most of the time the water would pass through the turbines and not over the rapids.

Regarding the utilisation of geothermal steam, the committee states that the recommendations of the Ministry of Works, supported by Messrs. Merz & McLellan, on the Wairakei plant extensions should be implemented and that construction of Stage 2 should proceed without interruption. Included in the recommendation is the provision of a trial unit to demonstrate the use of "flash steam" from otherwise wasted hot water. Stage 3 should be completed as found practicable and necessary.

To cater for peak loads, the provision of a gas turbine plant of 107·5 MW near Wellington is recommended.

Cook Strait Cable "Practical and Economic"

Interconnection of the North and South Island systems is considered to be the key to the general availability of cheap hydro-electric power and, "firmly believing it to be practicable and economic," the committee recommends that approval in principle should be given to the Cook Strait cable. The interconnection, which should be a d.c. link designed for a capacity of 600 MW but capable of being increased, should be in operation at the same time as the Benmore hydro-electric station. The conclusions of British Insulated Callender's Cables, Ltd., and A.S.E.A.'s report on the use of d.c. are set out in an appendix.

The station now being built at Mercer is coal-fired. Apart from the difficulty of obtaining sufficient fuel, however, the cost of power is said to preclude additions to this type of station, and atomic power is also ruled out for the present on grounds of cost, the committee believing that New Zealand possesses better sources of power to meet the country's needs for some time to come. The cost of production at Benmore, for example, is estimated at 0·290d/kWh and at Wairakei (Stages 1-3), 0·362d. These figures compare with 0·860d at Mercer and not less than 1d at an atomic station.

Tests on Cables of 10 kV to 66 kV

A SECOND edition of Publication No. 55 of the International Electrotechnical Commission, entitled "Recommendations for tests on impregnated paper-insulated metal-sheathed cables for 10 kV to 66 kV (50 to 60 c/s) (excluding gas-pressure and oil-filled designs)," replaces the first edition of 1936. It is available from the I.E.C. Headquarters, 1 rue de Varembé, Geneva, at 5 Swiss francs.

Tests specified are: conductor resistance; high-voltage at works; dielectric power factor at ambient temperature; high-voltage test after laying. Sample tests required are mechanical and dielectric security. Type approval tests cover power-factor at various temperatures. Ambient temperature is taken as lying between 5 and 25 deg C for temperate climates and between 15 and 45 deg C for tropical climates.

INDUSTRIAL NEWS

European Free Trade Conference

The Incorporated Sales Managers' Association is holding a conference at the Royal Festival Hall, London, on 28th October (9.30 a.m. to 5 p.m.), when the subject for discussion will be "Preparing for the Challenge of European Free Trade." The conference will be divided into four sessions and the chairmen will be Lord Woolton (president of the Association) and Mr. E. C. Lee (chairman of the Association). A number of prominent men are taking part and the speakers will include Mr. A. Maudling, M.P., Mr. Leslie Gamage (for the Federation of British Industries) and Mr. P. Reilly (Council of Industrial Design). The conference fee is £2 10s (which includes buffet lunch and coffee and tea) and application forms can be obtained from the Director of the Association, 51, Palace Street, Westminster, London, S.W.1.

Proton-Synchrotron Contract

The Governing Board of the National Institute for Research in Nuclear Science has announced that a contract has been signed for the supply of the magnet yoke which is a major component of the 7,000 million electron volt proton-synchrotron being built for it on a site adjacent to the Atomic Energy Research Establishment at Harwell. The contract has been signed with Joseph Sankey & Sons, Ltd., who have undertaken to supply the 340 steel blocks required, each weighing 20 tons, at a total cost of over £1,250,000. The special steel required will be supplied by the Steel Co. of Wales.

Government Lead Stockpile

On 23rd January the Board of Trade announced that it had decided to sell about 30,000 tons of lead for delivery over a period ending in November. In continuation of the policy set out in the 1956 Defence White Paper (Cmd. 9691, paragraph 125) of running down strategic holdings of industrial raw materials, the Board now announces that it intends to dispose of the whole of its remaining stocks of lead amounting to about 20,000 tons. No detailed plans as to the method and rate of disposal can be announced until discussions have been held with trade representatives, but the monthly rate of disposals is in any event unlikely to exceed the present rate of some 3,000 tons a month. No lead will be offered for delivery before December next.

Lamp Manufacture in Ceylon

Plans have been completed in Colombo for a factory which will produce nearly two million 15 W to 1,000 W electric lamps annually. This project will be carried out in accordance with the recommendations made by Mr. T. Kawai (Japan) under the Colombo Plan. The report submitted by him to the Ministry of Industries gives a detailed account of the possibilities of the electric lamp industry in Ceylon.

At a conference presided over by the Director of Industries, Mr. R. A. Wijekoon, it was decided to accept the Japanese expert's proposals to assist the industry. A number of technicians trained in Japan will be going to Ceylon shortly to train local men. The project also provides for the blowing of glass in Ceylon. The Government has already granted Rs.300,000 towards the capital cost of the factory. Last year Ceylon imported nearly three million lamps.

A.E.I. Lamp & Lighting Building Programme

Part of a large scale A.E.I. Lamp & Lighting Co. building programme, including administrative and factory buildings, is now nearing completion at Leicester, adjacent to the Melton Road Lamp Works, and at the lighting fittings factory at Hereford. The administrative headquarters of the manufacturing and sales sides of the company which have in the past been at Rugby and London will be concentrated at the new headquarters at Leicester. The move from Rugby will take place in the New Year and both the Lamp and Lighting Departments will leave London to move into their new offices at Leicester in the spring.

The new Leicester headquarters, which will cost about £500,000, will provide 60,000 sq ft of office accommodation and 40,000 sq ft of engineering laboratories. The administration block is a 4-storey L-shaped building, partly enclosing the laboratory. The lighting of the new building will be of the most advanced type and special facilities will be available for the demonstration of new lighting fittings and techniques.

The expansion programme at the Hereford Works at Rotherwas includes new photometric and electric laboratories which were opened earlier this year, and new buildings for the manufacture of lighting chokes and transformers.

An artist's impression of the new building which is nearing completion for the A.E.I. Lamp & Lighting Co. at Melton Road, Leicester

Scottish Modern Homes Exhibition

An interesting feature of this year's Modern Homes Exhibition in the Kelvin Hall, Glasgow, which opened on 2nd October and closes tomorrow (Saturday), is a joint effort between the South of Scotland Electricity Board and some twenty manufacturers to present an "Electricity Pavilion." This is an area to the rear of the hall terminating in the Board's stand where the manufacturers have their stands together in a separate area instead of scattered throughout the hall as on previous occasions. The South of Scotland Board is presenting "Electricity's Ultra Modern Home," a glimpse into a home of 2,000 A.D., as its main display. On show are futuristic cooking appliances, washing up units, three-dimensional television sets, storage cupboards, and automatic chores-units for the mixing, washing and other preparation of food.

E.I.B.A. West Devon Branch

Over forty people attended the inaugural meeting of the West Devon Branch of the Electrical Industries Benevolent Association held in the Plymouth S.W.E.B. Service Centre on 3rd October. Mr. G. Gladwell, convener of the meeting, proposed that a branch be formed and the resolution was carried unanimously. Mr. S. G. Monk, formerly head of the Department of Electrical Engineering at the Technical College, Devonport, was elected chairman, Mr. Bruce (Admiralty) was elected secretary, and Mr. Cavendish-Land (S.W.E.B.) was elected hon. treasurer. Three subcommittees were appointed to deal with welfare, finance, and social

matters, and the members of the first two of these committees, together with the chairman of the Social Committee, were appointed to form the main committee. Mr. H. Senior Fothergill, the secretary of the E.I.B.A., welcomed the formation of a branch in the West Country and outlined the duties and responsibilities of the committees. It had been thought that Cornwall might be part of the new branch but it was decided that because of the inconvenience of travelling between Cornwall and Plymouth it would be of greater advantage to the Association if the friends of E.I.B.A. in Cornwall could form their own branch.

Electrical Engineering Exhibition

The British Central Electrical Co., Ltd., held its eighth annual Electrical Engineering Exhibition at Grosvenor House, Park Lane, London, on 27th September, when a wide range of technical electrical equipment was shown. There were nearly five hundred visitors, representative of industry, education and Government departments, and among them were five from France, including Mr. L. Bernis, director of the French Electrical Wholesalers' Federation and secretary-general of the European Union of Electrical Wholesalers.

On its own stand the company gave the first public demonstration of the "Lumandar"—a photo-electric contactor which will break 10 A a.c. or d.c., and is no larger than a radio valve. It is suitable for the automatic control of street, factory and airport lighting and needs no maintenance.

Mr. G. Conradi, managing director, received the guests with Mrs. Conradi, and mentioned that the company was now in its fiftieth year and had recently opened its first branch at Yeovil, Somerset. The following companies also exhibited: A.E.I. Lamp & Lighting Co., Aidas Electric, Allen West & Co., Cayson Electrics, Chilton Electric Products, the General Electric Co., and Ottermill Switchgear.

Railway Facts and Figures

The British Transport Commission, 222, Marylebone Road, London, N.W.1, has issued a new edition of its "Facts and Figures about British Railways." This contains tabulated matter relating to the operation of the British Railways in 1956, together with those of the catering and shipping services. The progress made with the railways' modernisation plan is recorded. Copies of the booklet can be obtained, free of charge, from the Commission.

Protection for Australian Radio Industry

The Australian Tariff Board is to consider whether assistance shall be accorded to the manufacture of a wide range of radio and television equipment and also what margin of protection should be provided between the Customs duty and Excise duty on valves for radio-telegraphy and radio-telephony.

Notification of proposals to tender evidence has to be made to the Australian authorities by 21st and 25th October, respectively, and United Kingdom trade associations or firms desiring to submit evidence are asked to advise the Commercial Relations and Export Department of the Board of Trade, Horse Guards Avenue, Whitehall, London, S.W.1, before these dates, quoting references Nos. C.R.E. 9743/57 and C.R.E. 9793/57, respectively.

The *Board of Trade Journal* also reports that the Tariff Board has been asked to consider whether assistance should be given to manufacturers of a.c. induction motors.

Burmese Import Duties

The *Board of Trade Journal* publishes a list of revised import duties instituted by the Government of Burma on 24th September. They include an *ad valorem* duty of 60 per cent on a range of domestic electrical appliances and radio equipment and one of 25 per cent on flashlights and parts, including batteries.

National Smoke Abatement Society

At the annual general meeting of the National Smoke Abatement Society, following the recent conference at Hastings, it was announced that the Society's proposals for incorporation had been approved by the Board of Trade and it was agreed that, subject to the completion of remaining formalities, the Society should become the National Society for Clean Air from 31st December next. Dr. R. Lessing was re-elected president of the Society and Dr. J. S. G. Burnett, medical officer of health, Preston, was elected chairman of the Council in succession to Mr. F. J. Redstone. Mr. J. Irines and Dr. J. L. Burn were elected deputy chairmen.

Wholesalers' New Showrooms

J. Walton (Electrical), Ltd., of Salford, Manchester, electrical wholesalers, celebrate their twenty-fifth anniversary this year, and this coincides with the opening by the company of new showrooms at Salford and Preston. At 4-8, Great George, Salford, the display rooms (one is shown in the accompanying picture) provide ample space for a wide variety of domestic appliances, radio and television equipment, and similarly at 45, Tithebarn Street, Preston, the new showrooms, which replace smaller premises, show in a modern setting a full range of appliances.

Part of the new Salford showrooms of J. Walton (Electrical), Ltd.

Mishap at Windscale

Alarm was caused last week at the Windscale plutonium separation plant of the United Kingdom Atomic Energy Authority. A statement issued by the Authority said that it was discovered on Thursday afternoon that some of the uranium fuel cartridges in one of the two piles had become overheated. By injecting water into the pile the combustion was arrested and the temperature reduced. Some oxidisation of the uranium occurred; the greater part was trapped by the filters in the chimneys but a small amount was distributed over the works area and special precautions were taken.

It was stressed that this type of accident could occur only in an air-cooled open circuit pile; it could not happen at Calder Hall or any of the stations now being constructed for the Central Electricity Authority. It was thought to be likely that the affected pile would be out of commission for some months.

Nucleonic Measurement

A 15 min film showing the application of the "Atomat" thickness gauge manufactured by the Baldwin Instrument Co., Ltd., Dartford, Kent, was shown in London recently. The instrument utilises atomic radiation to determine the thickness of a wide range of materials during manufacture and the accuracy is such that it results in finer production limits, less wastage of material and a high quality product.

The principle of the instrument is based on the fact that when nuclear radiation strikes a sheet of metal, paper, or in fact any other material, part of that radiation is reflected or scattered and part is absorbed, while the remainder passes through the sheet. The "Atomat" uses either the radiation which penetrates (transmission gauge) or radiation which is

scattered (backscatter gauge) as the basis of measurement.

When the transmission gauge is in use the radiation which penetrates the sheet falls on to a detector, stimulating an electric current which after amplification is fed to an indicator. Both current and indicator reading depend upon the amount of radiation penetrating the sheet, which is governed by the weight per unit area. Normally the indicator is calibrated in weight per unit area, but when the density is constant, as it is with metals, it may be calibrated in thickness. When it is necessary to measure a coating on a sheet rather than its total weight, the differential "Atomat" is used. This is fitted with two measuring heads, one for the coated sheet and the other for the uncoated sheet, the difference between the two being indicated by the instrument. If the material to be gauged is only accessible from one side, the backscatter gauge is employed. Here the reflected or scattered radiation is utilised by a measuring head having a radioactive source and detector mounted in one unit. The radiation passes from the source through the material, strikes the backing and is reflected on to the detector.

Furnaces for Canada

An order valued at approximately $500,000 has been obtained by G.W.B. Furnaces, Ltd., Dudley, from the Canadian Steel Wheel Co., Montreal, for two 40 ton capacity direct arc steel melting furnaces. The furnaces will be to the designs of the British company's Italian associates, Leone Tagliaferri & Co., Milan, although the complete furnaces (except the refractories and some ancillary equipment which will be obtained in Canada) will be supplied from this country. The furnaces will be rated at 17,500 kVA through an on-load tapped transformer. Three 18in diameter graphite electrodes are to be fitted in each furnace. The furnaces are of the top charging type in which the roof is lifted and swung aside to receive the charge from drop-bottom charging baskets. The three graphite electrodes are to be controlled hydraulically by means of the patented Tagliaferri system.

Lamp Discounts

The General Electric Co., Ltd., announces revised discount arrangements applying to Osram lamps (15-150 W, 200-260 V) in clear, pearl, "silverlight" or pink pearl finishes when fitted with e.s. caps. Wholesalers, retailers and users are now entitled to their full standard discount on these lamps irrespective of the quantity ordered per item. The minimum quantity clause now applies only to lamps in this range with b.c. caps.

International Combustion Acquisition

International Combustion (Holdings), Ltd., has acquired the Clayton Equipment Co., Ltd., of 138, Borough High Street, S.E.1, whose main products are diesel-electric locomotives, electric battery locomotives, electric trolley locomotives, and cement making plant by the vertical kiln process. Mr. S. R. Devlin, who was the founder of the business, will continue as managing director.

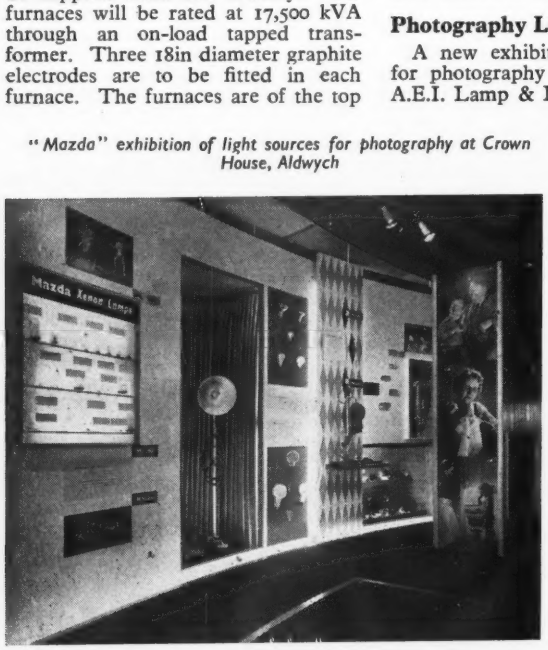
George Johnstone Lecture Postponed

Owing to indisposition Sir Harold Hartley will be unable to deliver the George Johnstone Lecture on 25th October as planned. The South Western Electricity Board hopes, however, that he will be able to present it in March or April next year.

Photography Lighting

A new exhibition of light sources for photography was opened by the A.E.I. Lamp & Lighting Co., Ltd., at the "Mazda" showroom, Crown House, Aldwych, on 8th October. This exhibition shows "Mazda" photographic light sources of types used by both the amateur and the professional photographer, together with the appropriate equipment marketed by all the leading photographic companies. The exhibition is divided into sections which include displays of "Mazda" photoflash bulbs in the latest photoflash equipment, xenon flash tubes, enlarger lamps, photo-floods and projector lamps and studio lamps. A small fully equipped studio is provided for the use of visitors. B.T.H. film projectors are also shown.

"Mazda" exhibition of light sources for photography at Crown House, Aldwych



Technical Training

In his address to the Ipswich and District Electrical Association at the opening meeting on 23rd September, Mr. R. A. Jackson, the chairman, spoke of technical training in the electrical industry. He said that head teachers of grammar and independent schools did not fully realise the importance and scope of the industry. After referring to the training schemes of large organisations, Mr. Jackson said that the smaller firms were at a disadvantage and in order to remedy this technical training on a co-operative basis by the medium sized firms must be fully exploited. A number of schemes had been commenced to enable smaller firms to give comprehensive training with qualified supervision.

Mr. C. T. Melling, president of the Association, proposed a vote of thanks to Mr. Jackson.

Electrical Engineers' Exhibition Exhibitors' Committee

In response to the wish of a large majority of the exhibitors who participated in the last Electrical Engineers' (A.S.E.E.) Exhibition, the B.E.A.M.A. Publicity Committee has agreed to act as an Exhibitors' Committee, to represent all exhibitors. Non-members will be co-opted to serve on this committee.

Overhauling the Cunarders

Included in the supply by Laurence, Scott & Electromotors, Ltd., of nearly 2,200 h.p. of additional electric motors for the recently announced overhaul of Cunard ships are four 200 h.p. motors and control gear for air-conditioning in the *Mauretania*. These orders bring the total h.p. of electric motors supplied by the company for the Cunard fleet to nearly 72,000 h.p. and include motors for engine-room and other auxiliaries and over 200 winches.

Ferodo Diamond Jubilee

To mark the diamond jubilee of the beginning of the work of its founder, Herbert Frood, Ferodo, Ltd., is holding a number of special events. These include a celebration at the Savoy Hotel, London, on 23rd October, at which leading figures in the motor industry will be present, a staff dance and a concert by the Ferodo Works Band. An official history of the company has also been prepared.

Electronics Course

The Factory Department of the Ministry of Labour and National Service is organising a course on "Electronics in Industry," which will be held from 20th to 24th January next at Burton Manor Residential College for Adult Education, Burton in Wirral,

Ches. The fee will be £6 for people from the local education authority areas of Birkenhead, Bootle, Cheshire County, Lancashire County, Liverpool and Wallasey, and £7 for those from other areas; it will include tuition and residence. Applications should be sent to the warden, Mr. J. B. Newton, at the college.

I.E.E. North Midland Dinner

The annual dinner of the North Midland Centre of the Institution of Electrical Engineers will be held on 15th November (7 for 7.30 p.m.) at the Queen's Hotel, Leeds. Mr. T. E. Goldup, President of the Institution, will attend. Applications for tickets (28s for members and 15s for students) should be made by 8th November to Mr. H. A. Carr, c/o A. Reyrolle & Co., Ltd., 20-22, St. Paul's Street, Leeds, 1.

English Electric in Australia

The new company formed by the English Electric Co., Ltd., in Australia will be known as the English Electric Co. of Australia Proprietary. It has an authorised capital of £A3,000,000, and the general manager in Australia, Mr. C. W. Goodman, becomes chairman and managing director. Co-directors are Mr. A. H. McCutchan and Mr. T. C. Read.

International Instrument Show

The 4th International Instrument Show will be held at Caxton Hall, Westminster, London, S.W.1, from 24th to 29th March next.

Washing Machines for New Zealand

Bendix Home Appliances, Ltd., has received an order valued at £500,000 for 5,000 "Gyramatic" washing machines from New Zealand.

Outlook for British Exports

The October issue of the *G.E.C. Export Guide* indicates continuing opportunities for British manufacturers to enter foreign markets. The most up-to-date information available on the export prospects for 36 major groups of British products in 34 countries is set out together with an indication of the economic conditions in these countries. The current prospects for exports are said to be "good" in 19 countries, "improving" in 5, "deteriorating" in 5 and "bad" in 5.

Copies of the *G.E.C. Export Guide* are available free of charge from the Economic and Marketing Research Unit of the General Electric Co., Ltd.

Computer Standardisation

Simplifying the field of computer equipment through standardisation is one of the aims of the Data Processing Section of the Radio Communication and Electronic Engineering Association which is now meeting regularly under the chairmanship of Mr. C. Metcalfe (E.M.I. Electronics, Ltd.). Four working parties set up by the Section's technical sub-committee (chairman Mr. C. Kramskoy) have already gone a considerable way towards the formulation of standards, and the Section is working closely with the British Standards Institution.

One working party has just completed the task of drawing up a chart for work on the many components and nomenclature used in computer fields, while another party is considering standards for tape and will have a specification ready to submit to the B.S.I. before the end of this year. This will cover the requirements of both analogue and digital computers.

The production of specifications for an input keyboard and for a simple output device is being dealt with by a third working party and yet another group is now studying information storage cores.

On the main committee one of the matters of joint interest receiving attention is the many associations and sections being formed in England to discuss data processing equipment, and it is the aim of the R.C.E.E.A. Data Processing Section to see if a joint organisation can be formed through which could be pooled all matters of national interest.

The R.C.E.E.A. is collaborating with the Office Appliance and Business Equipment Trades Association in organising the first British Electronic Computer Exhibition to be held at Olympia, London, from 28th November to 4th December, 1958.

A.P.L.E. Conference

In our report of the discussion at the annual conference of the Association of Public Lighting Engineers on the paper "The Lighting of Bridges and Tunnels" (*Electrical Review*, 27th September, page 557) the third speaker was incorrectly given as Mr. R. S. Hazell (Revo Electric Co.). The name should have read Mr. H. Hazel (L.C.C.).

Wire Gauge Table

A comparative wire gauge table has been produced by Edmundsons Supply Corporation, Ltd., showing comparisons between British Standard conductors and the nearest American conductor size, including mineral insulated cable. These are available from the company at 240-250, Ferndale Road, London, S.W.9.

Electricity in the Home

The name of the Jackson Electric Stove Co., Ltd., manufacturers of the "Jill" range of storage water heaters, was inadvertently omitted from the list of makers published in our last week's issue (p. 671). Reference to the company's range was, however, made on page 658 of the same issue, the 3-gallon model being illustrated.

Change of Name

The name of Costain-John Brown, Ltd., a subsidiary of John Brown & Co., Ltd., has been changed to Constructors John Brown, Ltd.

Trade Announcements

The **Tetra Engineering Co., Ltd.**, 1-3, Redhill Street, London, N.W.1 (telephone: Euston 3707), are now acting as distributors in this country for the range of Heraeus thermometers made by W. C. Heraeus G.m.b.H., of Hanau, Germany. A number of leaflets describing these thermometers can be obtained from the Tetra Engineering Co.

Klockner Moeller England, Ltd., are opening offices on 1st November at Guildhall Buildings, Navigation Street, Birmingham, 2 (telephone: Midland 2891), and 451, Durham Road, Low Fell, Gateshead-on-Tyne, 9, Co. Durham (telephone: Gateshead-on-Tyne 77035).

Wallace & Tiernan, Ltd., have acquired the share capital of **E.C.D., Ltd.**, Tonbridge, Kent, precision engineers, manufacturers of proportioning pumps, ozone generating equipment and air conditioning plants. No change in the management or personnel is intended, and the company will continue as heretofore under the guidance of Mr. E. Williams, managing director. Mr. E. J. Tucker and Mr. D. H. Johnson remain on the board, which will be strengthened by the appointment of three Wallace & Tiernan directors: Messrs. W. H. Wood, W. Dixon and B. Frisell.

Mr. H. A. Herzogenrath has been appointed as sales representative for **Wolf Electric Tools, Ltd.**, London, for their industrial and domestic range of portable power tools on the Dutch market. Mr. Herzogenrath has now commenced his duties in Holland and is working with the Wolf agents, Joh. Westhof Im-En Export Mij., N.V., Dr. Kuyperstratt 23, The Hague.

The telephone number of **Whitetrade, Ltd.**, Rochester, Kent, is now Chatham 41133.

The **Ensel Electric Co., Ltd.**, is opening new showrooms and offices at 3, Eden Grove, London, N.7 (telephone: North 5866), on 21st October.

Partial occupation of the new 180,000 sq ft **Permali, Ltd.**, factory at Gloucester has now released more space in the existing works to expand manufacture of P.T.F.E. (polytetrafluoroethylene) products. This plastic material is sold under the newly registered name of "Permaflon" and, besides dielectric and other properties, it is a non-tracking (Class C) insulation material used for most types of small electrical and electronic components. It is available in sheet, block, cylinder, rod and other forms, including dispersion coatings.

Griffin & George, Ltd., laboratory furnishers, announce that their sales office and warehouse for the Birmingham area is now Frederick Street, Birmingham, 1 (telephone: Central 2552). The telephone number of their Edinburgh office is now Caledonian 4868.

Japanese Electrical Trade

EXPORTS AND IMPORTS IN 1956

LAST year Japan enjoyed the greatest boom since the war. Continued business expansion overseas and rationalisation of industry contributed to raise her exports to £18 million, representing a 62 per cent increase on 1955. (Table 1.) Japanese imports rose by 31 per cent during the same period. (£1 = yen 1,003.)

Table 1.—Summary of Japan's Electrical Trade (000 yen)

Class	Exports		Imports	
	1956	1955	1956	1955
Motors, generators, convertors, alternators, transformers and switchgear	2,327,473	2,188,321	2,253,887	2,373,597
Batteries	317,453	108,577	5,625	5,728
Bulbs and lamps	2,078,770	1,601,144	14,502	13,809
Radio and TV receivers, microphones, loudspeakers, electronic tubes, radar and parts	3,119,965	1,049,144	3,028,114	2,028,204
Telephone and telegraph apparatus (other than radio)	266,834	224,882	250,354	198,818
Thermal apparatus	178,089	75,547	120,803	23,342
Electrical appliances for motor vehicles, cycles, aircraft, ships, etc.	1,228,940	104,449	142,095	40,270
Measuring and indicating instruments	1,243,333	1,534,234	512,712	516,325
Medical apparatus	101,596	20,832	140,122	75,928
Portable tools and appliances	1,325,115	57,015	184,330	53,424
Cables and wires	3,437,392	1,124,089	510,390	388,384
Machinery, apparatus and appliances, n.e.s.	2,668,231	3,034,699	985,790	549,092
Totals	18,293,191	11,122,933	8,148,724	6,266,921

Rotating machinery, electronic equipment and lamps play an important part in Japan's electrical trade, details of which are shown in Tables 2 and 3. Both tables show principal countries and main products only. It will be seen that her exports, apart from her traditional Asian markets, were mainly directed to the United States and the Latin-American countries.

In some instances Japanese electrical manufacturers penetrated into Commonwealth countries with machinery, transformers, radio sets, lamps and insulators. As in previous years, the low prices favoured their export success. A widening of already existing licensing agreements covering not only conventional but also nuclear power station equipment, apart from other lines, with American and Continental firms, coupled with new inventions, modernised techniques and low labour charges, enable Japan to continue her fierce competition with foreign manufacturers.

In heavy machinery and plant Japan has rather less experience and lags further behind in technique. Nevertheless her competitiveness is considerable, especially because she fits her export of capital equipment into the various international plans for the industrialisation of underdeveloped areas.

Electrical Manufactures

Some of the more important Japanese production figures are shown in Table 4. Motors, household meters, and radio receivers show the biggest increase. The main effort at present is concentrated upon developing electricity supply

Table 2.—Japan's Electrical Exports, 1956 (000 yen)

Class	Value
Generators, up to 25 kg	15,612
Ditto, over 25 kg up to 1,000 kg	57,480
Ditto, over 1,000 kg up to 5,000 kg	46,952
To Formosa	27,240
Ditto, over 5,000 kg	127,380
To Formosa	10,314
,, South Vietnam	13,796
,, Philippines	14,543
,, Brazil	86,992
Motors, up to 25 kg	186,798
To India	21,994
,, United States	92,484
Ditto, over 25 kg up to 100 kg	116,360
To Philippines	11,458
,, Indonesia	11,911
,, Mexico	24,120
,, Salvador	11,937
Ditto, over 100 kg up to 500 kg	127,358
To Formosa	82,466
,, Philippines	13,717
Ditto, over 500 kg up to 5,000 kg	117,023
To Formosa	47,783
,, Argentina	32,427
Ditto, over 5,000 kg	3,427
Transformers, up to 25 kg	87,733
To Formosa	16,966
,, Philippines	33,570
Ditto, 25–250 kg	57,816
To Ryukyu Islands	20,617
,, Formosa	22,989
Ditto, 250–1,000 kg	78,008
To Formosa	36,164
,, Thailand	22,079
Ditto, above 1,000 kg	275,015
To Korea	80,517
,, Formosa	82,601
,, Philippines	21,843
,, India	29,307
,, Brazil	40,798
Circuit-breakers	171,576
To Korea	17,979
,, Formosa	109,969
,, Brazil	19,968
Switchgear including switchboards, n.e.s.	111,972
To Formosa	92,403
Steam turbo sets, complete	110,971
To Formosa	25,434
,, Argentina	80,525
Generators, combined with motive machinery, n.e.s.	280,044
To Argentina	219,924
Parts of electric motors, generators, transformers, circuit-breakers, n.e.s.	243,507
To Formosa	68,482
,, India	36,483
,, Brazil	76,442
Batteries, dry cell	300,360
To Ryukyu Islands	35,055
,, Hong Kong	47,082
,, Iran	31,247
,, United States	30,054
Car lamps	178,856
Lighting fixtures for cars	93,902
Christmas tree lamps	1,255,914
To United Kingdom	9,665
,, Canada	52,588
,, United States	1,055,600
Miniature incandescent lamps, n.e.s.	214,615
To United States	76,956
Incandescent bulbs and tubes, n.e.s.	127,589
Radio receivers and chassis	1,707,598
To Hong Kong	68,778
,, Thailand	107,400
,, Iran	42,470
,, United States	952,325
,, Canada	68,417
,, South Africa	109,899
Electronic tubes	382,825
To China	80,851
,, Brazil	234,708
Parts of radio, telephone and telegraph equipment, n.e.s.	474,818
To Formosa	79,501
,, India	24,954
,, United States	90,035
,, Brazil	60,769
,, Argentina	91,236
Wire telephone equipment and parts	255,553
To Formosa	154,968
Dynamo bicycle lighting sets	869,308
To Hong Kong	94,647
,, Malaya	44,558
,, Singapore	198,271
,, Indonesia	194,950
,, India	122,790
,, United States	40,370
Electrical appliances for bicycles, n.e.s.	122,994
Ammeters and voltmeters	100,080
To China	50,583
Wattmeters, etc.	312,523
To Formosa	153,624
,, India	72,342
Fans	957,022
To Hong Kong	147,393
,, Cambodia	68,077
,, Malaya	60,363
,, Singapore	35,076
,, Iran	140,801
,, Iraq	150,002
Portable electrical tools	243,877
To United States	182,772
Insulated cables and wires, cotton insulated	112,052
Ditto, rubber insulated	276,459
Ditto, others	197,129
Power cables	158,664
To Formosa	99,900
Communication cables and wires	2,465,748
To Thailand	173,356
,, Pakistan	123,617
,, United States	2,066,464
Storage batteries	128,700
Porcelain insulators	1,405,906
To India	610,651
,, Pakistan	80,972
,, Sweden	127,341
,, Canada	53,815
,, United States	93,942
,, Australia	198,027
Insulation, ceramics	129,882
Machinery, apparatus and appliances, n.e.s.	536,967
To China	141,624
,, Formosa	85,652
,, India	81,225
Ditto, parts	287,002
To Formosa	78,785
,, India	62,551

Table 3.—Japan's Electrical Imports, 1956 (000 yen)

Class	Value
Generators up to 25 kg	8,437
Ditto, 25–5,000 kg	68,771
Ditto, above 5,000 kg	259,257
From United States	253,076
Motors up to 25 kg	36,961
From United States	28,463
Ditto, 25–5,000 kg	171,961
From United States	115,120
Ditto, above 5,000 kg (all from United States)	67,585
Transformers, under 25 kg	10,309
Ditto, 25–1,000 kg	31,923
From United States	29,963
Ditto, above 1,000 kg	178,704
From United States	178,592
Circuit-breakers	28,859
Switchgear and switchboards, n.e.s.	381,193
From United States	379,126
Generating sets, complete	309,331
From United States	274,959
Parts of machinery (rotating and static)	614,861
From United States	583,269
Wireless telegraph and telephone apparatus, n.e.s.	505,151
From United Kingdom	120,862
,, United States	315,060
Cathode ray tubes	28,731
From United States	27,936
Electronic tubes, n.e.s.	208,590
From United States	173,898
Vacuum tubes and parts	1,599,378
From United States	1,394,053
Radar equipment and parts	391,258
From United Kingdom	232,368
,, United States	156,909
Components for telephony and telegraphy, n.e.s.	204,648
From United States	146,898
Line telegraphy equipment	194,601
From United States	180,957
Line telephony equipment and parts	55,753
Welding machinery	83,773
From United States	57,911
Hand tools, portable, for wood, metal, n.e.s.	95,164
From United States	71,285
Cables and wires, rubber insulated	46,927
From United States	35,334
Power cables and wires	246,111
From United States	236,980
Communication wires and cables	77,826
Cables and wires, insulated, n.e.s.	113,360
Batteries, storage	63,217
Machinery appliances and apparatus, n.e.s.	555,842
From United Kingdom	56,459
,, United States	405,815
Ditto, parts	353,781
From United Kingdom	35,929
,, United States	266,725

for home consumption and simultaneously strengthening the nation's competitiveness in export markets. Though her electrical industry in recent years has grown considerably, future development will only be possible with adequate and cheap power.

Japan will in future continue trying to get a firm grip in overseas markets by price cutting, promises of speedy delivery, extension of technical help, promoting travelling fairs, and reopening trade offices.

Among the principal supplying countries, the United States ranks first with £5·7 million last year as compared with £3·6 million in 1955. United Kingdom electrical exports to Japan decreased from £1,091,335 in 1955 to £793,824 last year.

Table 4.—Japanese Electrical Production (Monthly Average)

Product	1954	1955	1956
Motors (units)	51,170	55,750	93,624
Generators a.c. (units)	224	195	178
Generators d.c. (units)	529	520	501
Transformers, standard (units)	10,450	11,173	19,474
Rectifiers (units)	69	61	66
Condensers, power (units)	27,681	33 439	61,487
Circuit breakers (units)	1,011	944	1,158
Fans (units)	46,816	42,542	66,441
Batteries, dry cell (000)	9,010	8,981	10,498
Batteries, storage (tons)	925	908	1,115
Watthour meters (units)	132,950	121,780	161,743
Lamps (000)	26,365	29,476	35,740
Vacuum tubes (000)	2,185	2,588	3,855
Radio receivers (units)	118,586	151,901	255,026
Radio transmitters (units)	15	135	346

French Electrical Industry in 1956

IN 1956 the total production of the French electrical and electronic industry amounted to fr. 664 milliard (compared with fr. 569 milliard in 1955); it employed 241,000 people (against 226,000) and paid fr. 142 milliard in wages (against fr. 121 milliard). The index of production (100 in 1949) reached 212 as compared with 184 in 1955—an increase of 15 per cent—and the general index of production, which is calculated on the same basis, rose from 135 to 147—an increase of 9 per cent. (A milliard francs is about equal to £1 million sterling.)

These figures were given by M. Henry Davezac, deputy vice-president of the Syndicat Générale de Construction Electrique, in the annual report which he presented to French electrical manufacturers recently. Their activities were affected, M. Davezac declared, by a growing increase in working costs. The cost of labour, for instance, had increased by 11·6 per cent between 1955 and 1956 and had reached an index figure of 237·1. Between 1949 and 1956 average earnings in the electrical industry increased by 141·3 per cent or 147·9 per cent (according to whether social charges were taken into account), whereas the cost of living (to an index based on 213 articles) rose by only 47·7 per cent.

This progress in the standard of living would be perfectly satisfactory, M. Davezac continued, if it were not for the enormous disparity between their wages and social charges and those of their foreign competitors. Although an increase in productivity had to be taken into account, how could this counteract such a rapid increase in the cost of labour and the new and multiple charges which continuously burdened production?

The increase in the cost of production was not the only reason for anxiety in the electrical manufacturing industry. They had no intention of questioning the control of prices in principle, and they did not contest that the extension of the range of mass production enabled some of the increases in the costs of production to be absorbed, but they denied that a control applied without discrimination could prevent repercussions from the cost of labour when this, M. Davezac stated, was rising at the rate of 10 per cent per annum.

Export Trade Promotion

Turning to the need to promote exports, M. Davezac asked how an industry could be placed in a position to expand if it systematically made a loss on the home market. In an industry such as theirs, this indispensable expansion was dependent on technical progress which had to be supported by continuous investment.

The growing difficulties which their export trade met at the moment, and the national need for its expansion, should stimulate them to fresh efforts. Confident of the assistance that they would get from the public authorities and convinced that the exporting capacity of an industry was a criterion of its vitality, M. Davezac declared that they were determined to persevere and to intensify their expansion. The professional commitments which they had already subscribed to in this domain, the measures of collective organisation which they had been taking, with a view to co-operation and joint action, bore witness to their goodwill.

During the next ten years their industry would have to provide, in both orthodox and nuclear materials, an output equal to the mass of electrical equipment at present in service, the construction of which had required 50 years of effort.

DOMESTIC ELECTRICAL EQUIPMENT

Hair Dryers

POSSESSION of an electric hair dryer is nowadays regarded as essential by most women. Not only is it capable of drying hair both speedily and efficiently, it also has the advantages of being extremely easy to operate and is completely safe in use. From the feminine point of view it is a pleasing and acceptable gift and it is, therefore, not surprising to learn from one manufacturer that the greater proportion of the company's sales is through the gift market, reaching its peak around Christmas.

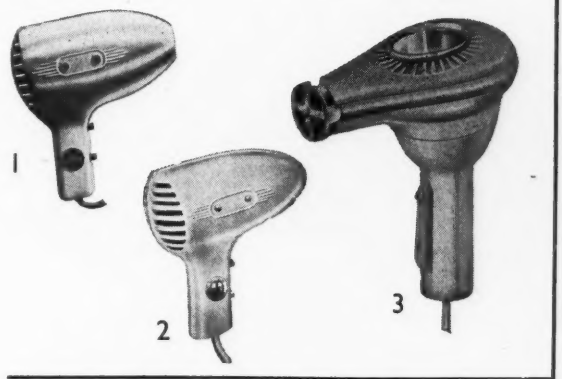
Although each manufacturer offers his own individual design the majority of hair dryers are basically the same, consisting of a plastic moulding which houses the fan motor and heating elements. The average loading is in the region of 400/500 W. Finger-tip switches for the control of hot or cold air are incorporated in the handle, enabling the dryer to be comfortably manipulated with one hand. The weight, an important factor in an appliance of this kind, varies between 1½ to 2½ lb and lightweight models, designed for travelling purposes, are available weighing less than 1 lb.

Stands which enable the dryer to be fixed in any desired position whilst leaving the hands free are obtainable with most makes at a small additional cost and among other extras offered are presentation caskets (which also act as stands), built-in mirrors, and plastic hoods which fit over the head of the user thus concentrating the flow of warm air from the dryer nozzle.

Recent introductions include a "teenager's" model from the G.E.C. in honeysuckle and maroon (Model DM397) and a streamlined dryer (HD40) from the Siroma Engineering Co. The Pifco hair dryer is now available with a choice of six colours, while a metal-cased hair dryer with a rubber-encased handle is offered by Southern Airframe Products, Ltd.

Manufacturer	Name or Model	Weight	Element Loading	Motor Loading	Special Features	Finish	Price (excl. tax)	Purchase Tax
BESTFREND ELECTRICAL CO., LTD., Diceland Works, Banstead, Surrey.	"Mitey"	1 lb	350 W	30 W	Lightweight, small size	Ivory, pink or blue Bakelite	£2 9 6 (in carton) £2 12 6 (in wallet)	£0 10 11 £0 12 2
	"Permaster" Model "C"	2¼ lb	400 W	30 W	For professional use, rubber buffer strip	Chromium on copper body, Bakelite handle	£2 19 6	£0 13 0
	"Consort"	1¾ lb	400 W	30 W	Built-in mirror	Ivory Bakelite, red and blue switches	£2 17 6	£0 12 6
BROWN BROTHERS, LTD., Great Eastern Street, London, E.C.2.	"Duco Boudoir"	3 lb	500 W	50 W	Streamlined shockproof case. Stand 16s extra plus 1s 9d P.T.	Peach Bakelite	£3 4 0 (peach) £0 5 6 (extra for T.V. suppressed models)	£0 14 5 £0 0 8
	"Duco Favourite"	2 lb	375 W	25 W	Lightweight a.c. only	Peach	£2 14 0	£0 11 10
BYLOCK ELECTRIC, LTD., 109, South Street, Ponders End, Middlesex.	"Dryad"	2 lb	400 W	25 W	Price inclusive of stand	Moulded in ivory semi-translucent plastic	£2 17 6	£0 12 6
	"Streamline"	2¼ lb	500 W	50 W	Stand 17s 6d extra plus 3s 10d P.T.	Pressed metal body, chromium plated	£3 19 6	£0 17 5
	"Queen"	2⅛ lb	500 W	50 W	Stand 17s 6d extra plus 3s 10d P.T.	White Bakelite	£3 16 6	£0 16 10
	"Simoom"	2⅛ lb	500 W	50 W	Stand 17s 6d extra plus 3s 10d P.T.	Walnut mottled Bakelite	£3 9 6	£0 15 3
	"Zephyr"	2¼ lb	500 W	50 W	Stand 17s 6d extra plus 3s 10d P.T.	Metal body sprayed in lavender, turquoise or blue	£3 9 6	£0 15 3
	"Simoom Gem"	2¼ lb	500 W	50 W	Stand 17s 6d extra plus 3s 10d P.T.	Moulded body in pastel colours	£3 9 6	£0 15 3
CO-OPERATIVE WHOLESALE SOCIETY, LTD., National Works, Hall Street, Dudley, Worcs.	"Minor"	2 lb	400 W	50 W	—	Black and ivory	£3 3 2	£0 14 3
ELECTROTHERMAL ENGINEERING, LTD., 270, Neville Road, London E.7.	"Solis" 54	1⅞ lb	400 W	—	With stand, suppressed	Ivory plastic	£3 2 7	£0 14 1
	"Solis" 97	1⅛ lb	350 W	—	Unusual tubular design, suppressed	Ivory plastic	£3 6 4	£0 14 11
	"Solis" 99	1⅜ lb	210 W	—	Unusual tubular design, fitted waving comb, suppressed	Ivory plastic	£7 2 6	£1 12 1

Manufacturer	Name or Model	Weight	Element Loading	Motor Loading	Special Features	Finish	Price (excl. tax)	Purchase Tax
ELECTROTHERMAL ENGINEERING, LTD., 270, Neville Road, London, E.7. *(continued)*	"Solis" 105	1¾ lb	550 W	—	Stand and mouthpiece extra, suppressed	Ivory plastic	£3 16 0	£0 17 1
	"Solis" 106	1¾ lb	750 W	—	4-heat control, stand and mouthpiece extra, suppressed	Ivory plastic	£7 10 9	£1 13 11
FALK, STADELMANN & CO., LTD., 91, Farringdon Road, London, E.C.1.	"U.95731"	1 lb	350 W	30 W	Available in leather pouch for travelling, suppressed	Blue, pink or cream	£2 12 6 £2 9 6 (without pouch)	£0 12 2 £0 10 11
JOHN A. FRANSEN, LTD., Northwood Hills, Middlesex.	"Forfex"	2 lb	750 W	80 W	Built for professional use, cold plus 3-heat air control	Maroon	£8 11 11	£2 1 3
GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.	"DM395"	2 lb	515 W	35 W	Radio and T.V. suppressed. Stand 16s 3d extra plus 1s 9d P.T.	Cream plastic	£4 8 2	£0 19 4
	"DM397"	2 lb	370 W	30 W	Radio and T.V. suppressed. Stand 4s 11d extra plus 7d P.T.	Honeysuckle and maroon plastic	£2 14 6	£0 12 0



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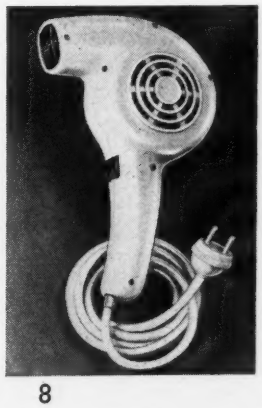
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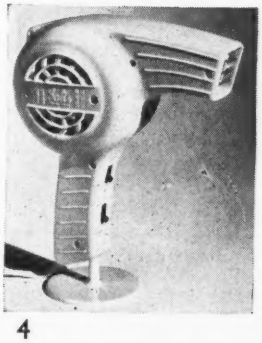
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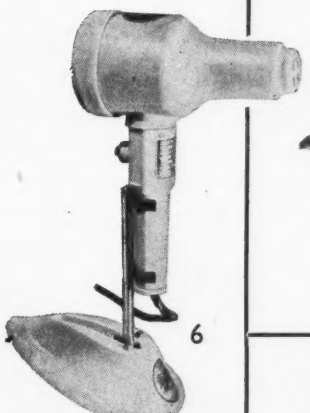

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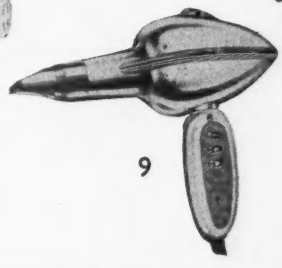
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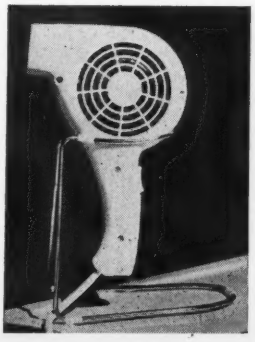
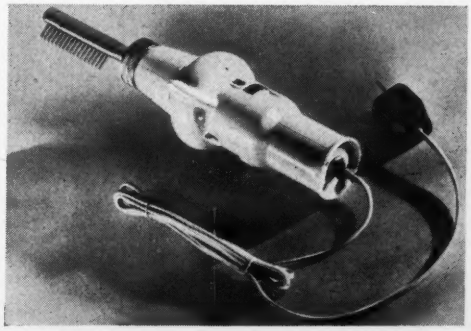


1. *Falk, Stadelmann U.95731 lightweight model*
2. *Bestfrend "Mitey"*
3. *Bestfrend "Consort"*
4. *Electrothermal Engineering "Solis" 54*
5. *G.E.C. DM397 hair dryer with stand*
6. *Bylock "Queen"*
7. *Bylock "Dryad"*
8. *Brown Brothers "Duco Favourite"*
9. *Fransen "Forfex"*
10. *C.W.S. "Minor"*
11. *Electrothermal Engineering "Solis" 99 fitted with waving comb*



Manufacturer	Name or Model	Weight	Element Loading	Motor Loading	Special Features	Finish	Price (excl. tax)	Purchase Tax
L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, London W.C.2.	"Supreme" L.G.H.95722	2 lb 6 oz	500 W	50 W	Radio and T.V. suppressed. Hair drying attachment £1 13s 4d extra plus 3s 8d P.T. Stand 16s 6d plus 2s P.T.	Ivory bakelite	£4 11 5	£1 0 0
	"Fair Lady" L.G.H.572	1 lb 7 oz	350 W	50 W	Radio and T.V. suppressed. Complete with plastic hood and presentation case	Ivory, green, pink or blue	£3 17 6	£0 17 0
HILLMAN ELECTRIC MOTORS, LTD., Crane Grove, Highbury, N.7.	"Hillman"	1 lb 12 oz	500 W	20 W	—	Ivory or cream	£3 0 0	£0 12 9
MORPHY-RICHARDS, LTD., 6, Conduit Street, London,W.1.	HDA/2	1 lb 11 oz	400 W	25 W	Capacitor induction motor, heater cut-out switch. Stand 5s extra plus 7d P.T.	Ivory plastic	£2 14 6	£0 11 10
ORMOND ENGINEERING CO., LTD., Rosebery Avenue, London, E.C.1.	"E.1022"	2 lb (3½ lb in casket)	500 W	50 W	Stand, mirror and comb	Walnut (*a*) or ivory (*b*)	£2 18 0 (*a*) £4 3 0 (*a*) (in casket) £3 3 0 (*b*) £4 10 9 (*b*) (in casket)	£0 12 9 £0 18 2 £0 13 10 £0 19 11
PIFCO, LTD., Watling Street, Manchester, 4.	"Pifco" 1050	2 lb	500 W	50 W	Stand 18s 6d plus 2s P.T. Hood 8s 1d plus 1s 10d P.T. Case £1 13s 4d plus 14s 7d P.T.	Ivory, pink, green, champagne, blue or lilac	£3 3 0	£0 13 9
SIEMENS EDISON SWAN, LTD., 38-39, Upper Thames Street, London, E.C.4.	"H.632"	2 lb (3½ lb in casket)	450 W	50 W	Available in casket including comb and mirror	Walnut (*a*) or ivory (*b*)	£2 18 0 (*a*) £4 3 0 (*a*) (in casket) £3 3 0 (*b*) £4 10 9 (*b*) (in casket)	£0 12 9 £0 18 2 £0 13 10 £0 19 11
SIROMA ENGINEERING CO., LTD., North Acton Road, Harlesden, N.W.10.	HD40	2 lb	375 W	25 W	A.c. only. Stand 16s extra plus 1s 9d P.T.	Peach plastic	£2 14 0	£0 11 10
SOUTHERN AIRFRAME PRODUCTS, LTD., 78, Buckingham Gate, London, S.W.1.	"S.A"	2 lb 4 oz	440 W	40 W	Metal casing, rubber encased handle	Cream crackle	£7 7 5	£1 11 11

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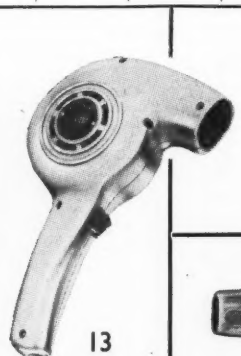

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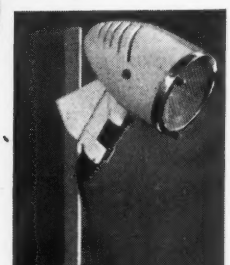

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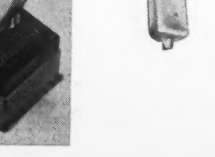


12. *Siemens model H.632*
13. *Siroma model HD40*
14. *L. G. Hawkins "Fair Lady"*
15. *Hillman hair dryer*
16. *Morphy-Richards model HDA/2*
17. *Pifco model on stand*
18. *Ormond model E.1022*
19. *Southern Airframe's metal cased hair dryer mounted on stand*

GENERATION AND DEVELOPMENT

Slurry Fired Power Plant

On Friday last the 60 MW Barony generating station of the South of Scotland Electricity Board was officially opened by Mr. J. S. Maclay, Secretary of State for Scotland. The station is unusual in that it is designed to burn slurry from coal preparation plants associated with collieries in the area; a detailed description of the way in which this is done at Barony was published in our issue of 6th September last.

The station is now complete and Mr. Maclay performed the opening ceremony by synchronising No. 2 turbo-alternator set (after having been pronounced an "authorised person"). He was introduced by Mr. J. S. Pickles, chairman of the Board, who acknowledged the preliminary work done on the station by the Central Electricity Authority and the close co-operation of the Coal Board, both at local and national level. Except for some civil engineering work, the whole of the design and supervision of construction of this £5 million station had been done by the Board's own engineers. Mr. Pickles concluded by saying that the special significance of the station was that it was a pioneer attempt to utilise the large reserves of slurry which existed throughout our coalfields, and which in the national interest should be exploited.

In his address Mr. Maclay said that although Barony was a comparatively small station it was producing power from material which could virtually be put to no other use. Neither the housewife nor the industrialist was being deprived of power in one form to get it back in another; in this sense, Barony represented sheer gain. Mr. R. W. Parker then made a few brief remarks on behalf of the National Coal Board, and he was followed by Mr. C. H. Davy (Babcock & Wilcox, Ltd.), who spoke for the contractors.

Fixed Price Supplies

The London Electricity Consultative Council recently received a deputation of tenants of flats at Dover, Kingsley and Waleran Buildings, Southwark, who at present receive their electricity from the Fixed Price Light Co., Ltd. They emphasised the difficulties and inconvenience which arose from the present system and after consideration of their representations the Council decided to write to the Board regarding the prospects of a direct supply being afforded.

At last week's meeting of the Council it was reported that the Board had replied pointing out that such works, involving the provision of mains, transformers and service cables, entailed considerable expenditure. While it was hoped in time to provide direct supplies to all such premises, where the expenditure could be justified, at present the Board must apply the limited capital available where the needs were greatest. It had re-examined the particular case of the flats mentioned and agreed to allocate the necessary capital for the work to be carried out, subject to the premises being rewired to take the supply as soon as it became available.

In reply to a question it was indicated that there were some 12,250 consumers in the area who received their supplies from the Fixed Price Light Co. Regarding further applications, Mr. E. G. Rawkins (secretary of the Council) said it was not anticipated that the question of priorities would arise to any great extent since it did not appear that a large number of people would be willing to incur the expense of rewiring their premises.

Activities in London

A report for the period June-August submitted to the London Electricity Consultative Council last week showed that the simultaneous m.d. during the period was 1,090,800 kW (against 1,147,800 kW in 1956); the aggregate m.d. 1,170,700 kW (1,301,007 kW); and the kWh imported 1,276 million (1,258 million).

Failures of supply affecting more than a thousand consumers occurred on ten occasions in June, four in July and seven in August.

lighting points in commission rose

The total number of all types of during the period: tungsten filament by 586, fluorescent by 383, mercury-vapour by 373, and sodium-vapour by 490.

The total expenditure chargeable to capital during the first quarter of the current financial year was £1,432,743.

Hunterston Plans Approved

The final plans for the South of Scotland Electricity Board's £37 million nuclear generating station at Hunterston, Ayrshire, were approved on 11th October by Mr. J. S. Maclay, Secretary of State for Scotland. His approval embraces the siting of the station's buildings, the architectural design of the principal structures, which include the reactor building and the turbine hall, and the proposed route of the access road to the station.

Mr. Maclay consented on 29th July to the building of the station, as was recommended by Sheriff Harald Leslie, Q.C., who conducted a public inquiry into the project, to which various objections had been lodged. As also recommended by Sheriff Leslie, Mr. Maclay stipulated that the Board should consult the Royal Fine Art Commission for Scotland and the Amenity Committee appointed under the Hydro-Electric Development (Scotland) Act, 1943, about the position, design, and appearance of the buildings. Mr. Maclay's approval is in accordance with the views of these bodies.

Both these organisations, after visiting the site and considering the plans submitted by the Board, informed the Board that as the Secretary of State had consented to the station's construction at Hunterston, they did not recommend any change in the siting of the buildings on lines suggested by Sheriff Leslie, since they considered that no great advantage would be gained in amenity by making any change.

Opening of Ince Power Station

The Ince power station in the Wirral Peninsular, Cheshire, was officially opened by Lord Citrine, chairman of the Central Electricity Authority, on 9th October. Built at a cost of £13 million, primarily to serve the atomic energy factory at Capenhurst, the station has an installed capacity of 240 MW. As was mentioned in the description published in our last issue, it has semi-outdoor boilers and is being converted from pulverised-coal to oil firing.

Lord Citrine said that as a result of the unit system and other technical advances power stations were being built today at the same cost per kilowatt installed as they were nine years ago. This was a noteworthy achievement because the cost of manpower and materials had increased in some cases by up to 76 per cent. At that time the building capacity of a power station was estimated at between 48 and 60 cu ft/kW installed, but these figures were now down to about 33 cu ft/kW. The building capacity of Ince, excluding that part of the boiler house that was not covered, was 28 cu ft/kW, and this was lower than any other station in operation. Because of the urgent requirements of the Capenhurst plant Ince power station had to be planned and built at high speed. Many short cuts were taken in its construction, and Lord Citrine paid a tribute to Mr. F. H. S. Brown, then chief construction engineer of the Merseyside and North Wales Division and now a full-time member of the new Generation Board. The semi-outdoor boiler house had saved £250,000 on the cost of construction.

Mr. A. R. Cooper, divisional controller, in a tribute to Lord Citrine, said he came in as a stranger and had produced what had been described as the most outstandingly successful nationalised industry.

Financial Section

STOCKS and SHARES

TROUBLES have not come singly to the Stock Exchange over the past month. On the heels of the new Government measures to make money dearer and scarcer, and of the Chancellor's expressions of determination to make them work, a depression of considerable intensity spread in from across the Atlantic. Wall Street's fresh show of distrust in the American business prospect, with its discouraging implications for the state of world trade, would have been sufficient in itself to put an effective damper upon our own markets. In this combination of circumstances, the industrial market has still been having trouble in finding a footing. Gilt-edged stocks followed closely the course of the exchange rates of the pound.

"Growth" Stocks

In the further relapse of prices in the industrial market, depreciation continued to be especially marked in the category known as "growth" stocks, meaning those for which the investor is normally willing to pay a high price in consideration for outstanding promise of future expansion. Many shares of that description are of course related to the field of electrical engineering in general, and of atomic power in particular. The government's application of the brakes to the rate of industrial development has induced a modification of earlier assessments, and this would account for the severity of falls in the shares of the major electrical companies and of the heavy engineering firms such as Babcock & Wilcox, Simon-Carves, Clarke Chapman and Head Wrightson, which are joined with them in nuclear power groups. Of the numerous price changes recorded in the accompanying lists, the largest are again associated mostly with shares in that range. At the beginning of this week conditions were beginning to appear more stable.

Market Notes

Dealings have been taking place at around 11s (the official quotation was 10s 6d) in the 5s shares of Elliott-Automation, which represents the merger of the Elliott Brothers and Associated Automation companies. Head Wrightson shares were quoted at 16s 6d, ex the 50 per cent scrip issue and in their new 5s form. The price is equivalent to 99s for the former denomination of £1, in which form they were quoted up to 146s earlier this year. Vickers new 6 per cent loan stock remained only a fraction below the issue price of 96; the new ordinary shares became 15s paid-up last Monday and stood at a discount of about 1s. Preference shares on offer recently in moderate numbers included E.M.I. 5½ per cents at 15s 9d, yielding nearly 7 per cent; Hoover 5½ per cents at 17s 3d and Aerialite redeemable "sixes" at 18s 6d, giving a return of close on 6½ per cent; and Efco 5½ per cents at 16s 3d, yielding 6¾ per cent.

Dividends Declared

A fall in the price of Morphy-Richards 4s shares to 15s, following the

Price Changes in

Company or Board	Nom. Value	Middle price 14th Oct.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	71½		3	3	4 4 0	80	70
Brit. Elec. 1974/77	100	67⅛		3	3	4 9 0	78¼	66
Brit. Elec. 1976/79	100	70x.d.		3½	3½	5 0 0	81½	70
Brit. Elec. 1974/79	100	81	+⅛	4¼	4¼	5 5 0	92½	79½
Overseas Electric Supply								
Calcutta Elec.	£1	17/6		6†	6·8†	7 15 6†	19/-	15/-
East African Power	£1	20/-		7	7½	7 10 0	21/-	19/-
Nigerian Elec.	£1	17/6		10	10	11 8 6	18/6	17/3
Perak Hydro-Elec.	£1	16/6	+3d	10	12½	15 13 0	18/-	13/3
Electrical Shares								
Aberdare Cables	5/-	10/-	−9d	17½	17½	8 15 0	12/6	9/9
Aerialite	1/-	5/3	−3d	45	48	9 2 9	6/9	4/9
Allen, W. H.	£1	42/6		10	10	4 14 3	47/3	33/6
Anglo-Portuguese Tel.	£1	21/3	−9d	8	8	7 10 6	27/6	20/6
Aron Elec. Ord.	£1	55/-	−2/6	15	15	5 9 0	60/-	53/6
Assoc. Elec. Ord.	£1	50/-	−3/9	15	15	6 0 0	73/-	50/-
Automatic Tel. & El.	£1	62/6	−1/3	15	17	5 8 9	75/-	54/6
Babcock & Wilcox	£1	57/6	−6/3	15	15	5 4 3	82/6	57/6
Bakelite	10/-	22/3		16	15	6 14 9	24/6	20/9
Baldwin, H. I.	2/-	4/3		20	20	9 8 3	5/-	3/10½
Berry's Electric	5/-	6/3		—	10	8 0 0	6/6	5/6
British Aluminium	£1	43/9	−3/9	12	12	5 9 6	71/3	43/9
Brit. Elec. Traction: Def. Ord. "A"	5/-	20/-	−1/3	22½	25	6 5 0	25/-	17/-
B.I. Callender's	£1	41/6	−6d	12½	12½	6 0 6	55/-	41/-
B.I. Callender's 6% Pref.	£1	20/-	+1/-	6	6	6 0 0	21/9	19/-
British Tabulating	£1	38/-	−3d	9	9	4 14 9	56/3	38/3
British Thermostat	5/-	23/9		25	25	5 5 3	27/6	23/9
British Vac. Cleaner	5/-	5/-		15	10	10 0 0	8/-	5/-
Brook Motors	10/-	33/9	−1/3	25	25	7 8 3	37/6	30/-
Bulgin, A. F.	1/-	4/6	+3d	50	40*	8 17 9	5/6	4/-
Burco Dean	5/-	11/6	−3d	22½	20	8 14 0	14/-	8/9
Cable & Wireless: Ord.	5/-	9/6	−6d	10	10	5 5 3	12/6	9/6
4% Loan	100	91½		4	4	4 7 6	92½	89
Chloride El. Storage "A"	£1	57/-	−6d	17½	17½	6 2 9	68/9	57/-
Clarke Chapman	£1	125/-	−5/-	22½	27½	4 8 0	9	6¼
Cole, E. K.	5/-	16/9	−9d	17½	17½	5 4 6	23/6	16/6
Cossor, A. C.	5/-	5/3	−3d	Nil	2½	2 7 6	7/3	5/3
Crabtree	10/-	23/9		20	20	8 8 6	26/-	23/3
Crompton Parkinson Ord.	5/-	15/-		16	16	5 6 9	17/9	14/6
De La Rue	5/-	20/-	−2/9	30	35	8 15 0	24/9	16/3
Decca "A"	4/-	23/3	−1/3	43½	43½	7 10 6	32/3	23/3
Desoutter	5/-	34/6		30	32½	4 14 3	35/6	27/6
Dewhurst	2/-	6/6		30	16¼*	5 0 0	7/9	5/9
Dictograph Tel.	2/-	5/3	−3d	20	20	—	6/3	5/3
Dubilier Condenser	1/-	3/6		30	30	—	8/1½	3/6
Duport	5/-	17/-	−6d	23	25	7 7 0	21/-	17/-
E.M.I.	10/-	26/3	−1/-	15	15	5 14 3	36/-	23/9
Electrical Components	5/-	7/6		25	12½*	8 6 9	8/-	6/6
Elec. Construction	£1	23/9		8½	8½	7 3 3	27/6	21/9
Elliott-Automation	5/-	10/6		—	10‡	4 15 3	11/3	10/3
Enfield Cable Ord.	£1	15/-		Nil	Nil	Nil	21/6	13/-
English Electric	£1	51/3	−1/3	12½	14	5 9 3	65/-	47/6
English Electric 3½% Pref.	£1	11/3		3½	3½	6 13 3	14/3	11/3
Ericsson Tel.	5/-	40/6	+1/-	20†	22†	2 14 6†	50/-	33/3
Ever Ready	5/-	15/9	−9d	35	37½	5 19 0*	20/-	15/-
Falk Stadelmann	£1	36/3		17½	17½	9 13 0	40/6	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

declaration of the 12 per cent final dividend, was ascribed in some part to the disappointment of hopes that last year's three-for-two scrip issue might have as its sequel a larger distribution for the twelve months ended in June. The total payment of 20 per cent for this period is equivalent to the rate of 50 per cent paid for the previous year on the smaller capital, and puts the shares on a yield basis of 5·3 per cent. Broxlea Holdings 1s shares, which were marketed at about 2s 6d eighteen months ago, were outstandingly firm at 4s after the announcement of a 17½ per cent interim dividend on account of the year ending next February. For the previous period of 11 months a payment of 32½ per cent had been made. Wm. Sugg 5s shares were quoted nominally at about 5s 9d after the announcement of a lower profit and a reduction in the dividend to 10 per cent, supplemented by a tax-free capital distribution of 2½ per cent.

Electrical Investments

Company or Board	Nom. Value	Middle price 14th Oct.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1957 Highest	1957 Lowest
Electrical Shares—continued								
G.E.C. Ord.	£1	40/-	−2/6	·14	12½	6 5 0	58/9	40/-
G.C.E. 6½ Pref.	£1	20/-		6½	6½	6 10 0	23/6	19/6
General Cables	5/-	13/-		30	30	11 10 9	15/6	11/6
Greenwood & Batley	£1	50/-		17½	17½	7 0 0	50/-	45/3
Hackbridge Holdings	5/-	12/9	−6d	30	20	7 16 9	21/9	12/-
Hackbridge & Hewittic	5/-	11/3		23	20	8 17 9	16/-	11/3
Head Wrightson	5/-	16/6x.c.	−2/3	20	22½	—	24/3	16/6
Heatrae	2/-	4/9		15	15	6 6 6	4/9	4/-
Henley's	10/-	13/-	−1/-	11½	11½	8 17 0	17/-	13/-
Holophane	5/-	20/-	−2/-	30	30	7 10 0	26/3	17/-
Hoover	5/-	31/-	−1/-	50	50	8 1 3	44/-	24/9
I.C.I.	£1	38/-	−1/6	10	10	5 5 3	46/6	37/9
Intl. Combustion	5/-	21/-	−1/-	20	22½	5 7 3	30/-	20/-
Johnson & Phillips	£1	23/3		15	10	8 12 0	34/6	23/3
Lancashire Dynamo	£1	35/-	−3/9	11	11	6 5 9	45/-	35/-
Laurence, Scott	5/-	15/3		15	15	4 18 3	19/9	13/9
Lister, R. A.	£1	26/3	−6d	10	10	7 12 6	33/9	26/3
London Elec. Wire	£1	42/-	−1/9	12½	12½	5 19 0	53/9	42/-
Lucas, J.	£1	27/6	−1/3	7½	7½	5 9 0	36/6	27/6
Marconi Marine	£1	33/9		10	10	5 18 6	37/-	31/-
Marryat & Scott	2/-	11/9		30	35	5 19 3	13/-	8/-
Mather & Platt	£1	51/3	−2/6	15	15	5 17 0	63/9	51/3
Metal Industries	£1	25/3	−3d	Nil	9	7 2 6	30/-	20/3
Midland Elec. Mfg.	£1	47/6	−1/3	12½	12½	5 5 3	52/6	45/-
Morphy-Richards	4/-	15/-	−1/3	50	20*	5 6 9	20/-	11/9
Murex	£1	58/3		20	20	6 17 3	79/6	58/3
Newman Ind.	2/-	2/9		10	10	7 5 6	2/9	2/1
Oldham & Son	1/-	2/9		17½	17½	6 7 3	3/-	2/3
Parnall (Yate)	5/-	6/3	−3d	12	12	9 12 0	8/9	5/9
Parsons, C. A.	£1	45/-	−1/3	8½	7½*‡	—	71/3	45/-
Plessey	10/-	62/6		27½	30	4 16 0	86/3	61/-
Pye "A" Deferred	5/-	12/6	−9d	12½	12½	5 0 0	20/-	12/6
Reyrolle	£1	72/6	−3/9	16½	17½	4 16 6	110/-	72/6
Rheostatic	4/-	7/6		18½	12½*	6 13 3	10/-	7/6
Richardsons Westgarth	5/-	14/6	−9d	16⅝	16⅝	5 15 0	20/-	14/6
Scottish Cables	4/-	15/3	−1/6	27½	27½	7 4 3	19/3	15/-
Simon-Carves	5/-	23/9	−3/9	28½	20*	4 4 3	36/3	23/9
Smith (England), S.	4/-	13/-	−9d	17½	17½	5 7 9	16/-	13/-
Southern Areas	£1	11/3	−1/3	7½	7½	13 6 9	20/-	11/3
Strand Elec.	5/-	6/9		15	15	11 2 3	8/-	6/9
Sturtevant	5/-	20/6	−1/-	15†	15†	3 13 3†	27/-	20/6
Sun Elec.	£1	43/9		20	25	11 8 6	43/9	43/9
Switchgear & Cowans	5/-	10/3	−3d	25	25	12 4 0	15/6	10/3
Taylor Tunnicliff	5/-	12/3		15	15	6 2 6	13/9	11/9
T.C.C.	10/-	38/9	−2/6	25	25	6 9 0	41/3	35/-
T.C. & M.	£1	24/-	−6d	8½	8½	7 1 9	31/-	24/-
Telephone Mfg.	5/-	5/3	−3d	10	10	9 10 6	8/-	5/3
Telephone Rentals	5/-	10/6		12½	12½	5 19 0	12/6	10/3
Thompson (John)	5/-	24/-	−2/-	25	25	5 4 3	37/-	24/-
Thorn Elec.	5/-	20/6	−9d	15	17½	4 5 3	26/3	16/3
Thornycroft	£1	23/9	−1/3	15	12½	10 10 6	37/6	23/9
Tube Investments	£1	52/6	−6/3	22½	15*‡	5 14 3	70/-	52/6
Vactric	5/-	17/6		17½	25	7 2 9	23/9	12/9
Veritys	5/-	8/6		12½	12½	7 7 0	9/3	8/-
Walsall Conduits	4/-	11/-	−1/3	20	20	7 5 6	15/-	11/-
Ward & Goldstone	5/-	23/-		35	40	4 7 0*	29/-	18/6
Watford	2/-	6/3	−3d	25	25	8 0 0	6/9	6/3
Westinghouse	£1	31/3		18	9‡	5 15 3	41/3	31/3
West, Allen	5/-	10/6		15	15		13/6	9/6
Wolf Electric	5/-	9/-	−6d	20	20	5 11 0*	13/9	8/9

Duport Debenture

Fairly substantial amounts of the recently issued Duport 6 per cent debenture stock, redeemable 1982–87, have been available lately at an all-in price of 97½. The stock is at present £50 per cent paid-up, with the balance of £46½ per cent payable by the 29th of this month, and is transferable free of the usual 2 per cent stamp duty. Particulars published at the time of the issue in August showed the nominal amount of £1,950,000 stock to be covered nearly six times by net group assets, and the annual interest over eleven times by the lowest profit returned in the past three years, namely in 1953–4. It was anticipated that more difficult trading conditions would bring the profits of 1956–57 below the high level of the previous year.

Coming Dividends

Among the most interesting of the dividend announcements expected next month are those due from Joseph Lucas and S. Smith & Sons, both of which make up their accounts to the end of July. Last year's results were affected by the recession in the motor industry in the second half of the period, and since they were published at the time of the Suez crisis and petrol rationing, the reports anticipated difficulties ahead. Dividends were maintained at the previous levels with no difficulty, and still had more than threefold cover, in each case, from available earnings. Share prices have followed similar courses this year. Lucas shares started at 30s 9d and, partly on the strength of the revival in the car industry, had improved to 36s 6d before general market disturbances brought the price back to 27s 6d. S. Smith rose from 12s 9d to 16s before reverting to 13s.

Canadian Power

Stocks of Canada's principal electric power and other utility undertakings, which stood very high in the investor's favour earlier this year, have suffered severely in the relapse of transatlantic markets during the past month or two. Of the stocks most widely held in this country, British Columbia Power common shares stand now at $75, as compared with this year's best price of $115; Shawinigan Power at $45, against $68; Power Corporation of Canada at $106, against $175. Part of the declines are accounted for by a reduction to under 10 per cent in the premium at which dollar stocks are quoted here above the equivalent dollar prices.

REPORTS and DIVIDENDS

The East African Power & Lighting Co., Ltd.—The annual meeting was held on 30th September in Nairobi. In his circulated review of the past year, Mr. A. J. D. Small (chairman) said that sales of electricity to consumers in the group, excluding supplies from the Tanganyika subsidiary company to Mombasa, rose from 262·4 million kWh to 298·6 million kWh. The principal extension to be commissioned in the year was the new oil-fired steam station at Kipevu for the service of the Mombasa municipal area and of their area of distribution in the Coast Province. At Nairobi rapid progress was made with the installation of three 2,100 kW oil engine generators at Nairobi South station and these had since been placed in service. After dealing with various extensions at other stations, Mr. Small refers to the vesting in the Tanganyika Electric Supply Co., Ltd., of the property and business of the Dar-es-Salaam & District Electric Supply Co., Ltd., the progress of the Kenya Power Co., and the permit issued by the Government of Kenya to Power Securities Corporation, Ltd., which is financing the survey and design of the Seven Forks Development on the Tana River to construct the works at the appropriate time. Investigations in recent months had indicated that a series of developments based on the background of the Seven Forks scheme could be undertaken *seriatim* to a total of 220 MW when required, of which 100 MW would represent the output of the Seven Forks site itself.

Bennis Combustion, Ltd.—Gwent & West of England Enterprises has made a formal offer to purchase the 450,000 issued ordinary shares of Bennis Combustion, Ltd., at 10s 6d for each 5s share. The offer is conditional upon 90 per cent acceptance by 31st October or such extended date as may be arranged, but Gwent reserves the right to purchase such lesser number of shares for which acceptances may be received.

The directors of Bennis Combustion announce that they do not propose to make any recommendation regarding acceptance or non-acceptance of the offer and propose to leave shareholders to make their own decision. They consider, however, that the total purchase price of £236,250 (assuming all the ordinary shares are bought) is considerably below the value of net assets attributable to ordinary interests, which on the basis of the balance sheet on 30th April, 1957, was about £373,000. Value of orders received by the group during the year has again increased but profit margins are narrowing and this trend seems likely to continue. Provided that turnover can be increased, group profits for 1957-58, the board states, should remain at about the same level as for the last two years.

Morphy-Richards, Ltd.—The group profit for the year ended 30th June last amounted to £603,974, as compared with £580,061 for 1955-56, and after deducting depreciation, loan stock interest, etc., and £248,923 for taxation, the group net profit is £221,708 (against £244,951), of which £215,571 is attributable to the parent company. Special appropriations (expenses of capitalisation of reserves, loan stock issue, and building leases) absorb £50,082, and it is proposed to pay a final dividend on the ordinary stock of 12 per cent, making 20 per cent for the year on the increased capital of £648,625. A dividend of 10 per cent is also being paid on £20,960 ordinary stock issued in respect of an acquisition. The previous year's dividend was 50 per cent, paid on capital before a 150 per cent scrip issue.

George H. Scholes & Co., Ltd.—The accounts for the year ended 30th June last show a trading profit of £253,497, as compared with £249,553 for the preceding year, which with other revenue makes £259,269. After meeting all charges, including £113,047 for taxation, the net profit is £100,510 (against £101,233). Reserves receive £66,250, and the dividend for the year is maintained at 25 per cent with a final payment of 17½ per cent. The balance carried forward is £19,130 (against £16,560 brought in).

In his statement, Mr. F. J. Pearce (chairman and managing director) says the turnover for the year was a record, and although costs have increased they have been able to avoid increasing their selling prices. New lines are being developed and as they are marketed they will call for further extensions to the factory and plant, and the directors are looking into this matter.

Peto Scott Electrical Instruments, Ltd., reports a group profit for the year to 30th June last of £29,729, as compared with £34,904 for the preceding year. This figure is arrived at after deducting £29,400 for taxation. The dividend for the year is 12½ per cent (against 16⅔ per cent), and after placing £10,000 to general reserve, the balance carried forward is £60,857 (against £55,344 brought in).

Scottish Cables (South Africa), Ltd.—The accounts for the year ended 30th June last show a trading profit of £155,848, as compared with £188,962 for 1955-56. Taxation absorbs £41,800, and the net balance is £84,106 (against £110,030). The dividend for the year is 12½ per cent (against 14 per cent) and the balance carried forward is £70,644 (against £61,538 brought in).

Stothert & Pitt, Ltd.—The group profit for the year to 30th June last amounted to £904,311, as compared with £638,227 for 1955-56, and after deducting £416,259 for taxation the net balance is £488,052 (against £296,436). Reserves receive £175,000 and it is proposed to pay a final dividend of 12½ per cent, maintaining the ordinary distribution at 17½ per cent. The balance carried forward is £167,072 (against £149,939 brought in).

Ericsson Telephones, Ltd., proposes to make a one-for-one scrip issue, and an extraordinary meeting is to be held on 31st October.

The British Thermostat Co., Ltd., is paying an interim dividend of 7½ per cent (unchanged).

The Engineering & Lighting Equipment Co., Ltd., has announced an unchanged interim dividend of 5 per cent.

Mavor & Coulson, Ltd., have declared an interim dividend of 3¾ per cent (against 7½ per cent) on capital increased by a rights issue of one-in-four and by a 100 per cent scrip issue.

Glenfield & Kennedy Holdings, Ltd., has declared an interim dividend of 5 per cent (unchanged).

New Companies

W. L. Brooks, Ltd.—Registered 30th September. Capital £1,000. Buyers and sellers of apparatus and supplies of all kinds used in the electrical trade and in connection with the generation or distribution thereof, etc. Directors: W. L. Brooks and R. K. Parsons. Solicitors: Nash & Vann, Fleet, Hants.

Furneaux Riddall & Co., Ltd.—Registered 27th September. Capital £15,000. To acquire the business of electrical engineers carried on by H. S. Furneaux and F. J. Riddall at Southsea as Furneaux Riddall & Co., etc. Directors: H. S. Furneaux and F. J. Riddall. Regd. office: 46, Great Southsea Street, Southsea, Hants.

Cleveland Switchgear, Ltd.—Registered 25th September. Capital £1,000. Electrical engineers, etc. Directors: R. S. Fairfax, J. C. Jones and Mary J. Surtees. Solicitors: Thomas Magnay, Gateshead, 8.

D. W. Franklin, Ltd.—Registered 26th September. Capital £500. Electrical engineers and contractors, etc. Directors: D. W. Franklin and Olive J. Franklin. Regd. office: 174, High Street, Hounslow, Middlesex.

Liquidations

Baxters (Beeston), Ltd., radio, electrical and television dealers, 2, Hillside Buildings, Beeston, Leeds.—Winding up voluntarily. Liquidator, Mr. E. Greenwood, 32-33, Commercial Street, Leeds, 1, appointed 24th September.

Crosland, Ltd., factors and wholesalers of electrical goods, 85, Bradford Road C., Batley.—Winding up voluntarily. Liquidator, Mr. M. N. Shaw, Market Place, Dewsbury, appointed 30th September.

Northern Wholesale Electrical Distributors, Ltd. (In voluntary liquidation).—Meeting 7th November at 66, John Street, Sunderland, to receive an account of the winding-up by the liquidator, Mr. F. R. Clarke.

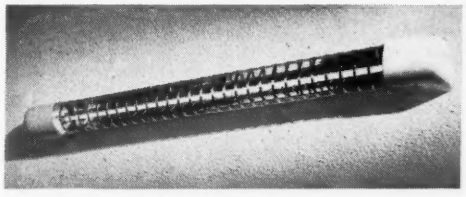
Bankruptcy

C. G. Carder, 2, Bone Hill, Buckingham, electrician.—First dividend of 1s 2d in the £, payable on and after 25th October at 58-61, York Terrace, Regent's Park, London, N.W.1.

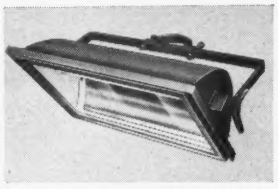
NEW ELECTRICAL EQUIPMENT

Wall Mounting Fire

A new wall mounting fire, the "Firestreak," has just been placed on the market by FERRANTI, LTD., Moston, Manchester. The element, which consists of an open wire spiral inside a silica glass sheath, is available in 350, 500 and 725 W loadings. This element is mounted in fork type contact arms. Servicing is simple as the reflector slides away from the guard making for ease of cleaning and replacement of the element. The fire measures



Ferranti "Firestreak" wall mounting fire

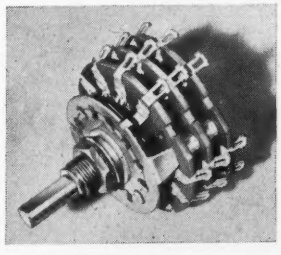


Rowlands pole mounting floodlighting lantern

27⅞in in length by 3in in height by 2¼in wide and is available for 200/220 and 230/250 V. There is a choice of six colours for the end caps which merely slide off and can be changed in a matter of seconds. The price of the fire is £3 13s plus £1 12s purchase tax in the United Kingdom.

Rotary Switch

The introduction of a new "Oak" rotary switch, model DQH, has recently been announced by N.S.F., LTD., 31-32, Alfred Place, London, W.C.1. This latest addition to the range incorporates the improved "D"



"Oak" rotary switch, model DQH

notched stator, and is available with one, two or three sections. The advantage of the notched stator is that it eliminates any trouble due to loosening of contact clips as a result of overheating during the soldering operation.

Model DHQ is made with a 30 deg throw only, and the following maximum switching is available:—Single pole, two to twelve positions; double pole, two to six positions; three pole, two to four positions; four pole, two or three positions; five pole on-off; and six pole on-off.

The illustration shows a typical three section switch and demonstrates its simple construction. This model can be fitted with an a.c. switch, in which case the last two wafers must be omitted.

Floodlighting Lantern

A downward lighting general purpose flood lantern for use with a 140 W sodium lamp has recently been introduced by ROWLANDS ELECTRICAL ACCESSORIES, LTD., R.E.A.L. Works, Hockley Hill, Birmingham, 18. It is a totally enclosed waterproof model and can be supplied either with a clamp for pole mounting or with a wall fixing bracket. The specular parabolic reflector fitted is of symmetric profile for uniform distribution. The price of the wall mounting fitting is £13 15s and the pole mounting model is £14 15s.

Convector Heaters

A new, low-priced, floor-standing "Ekco Thermovent" convector (Type K) is announced by E. K. COLE, LTD., 5, Vigo Street, London, W.1. A portable heater, it is available with a built-in two-heat switch (Type K2), or with automatic heat control (Type KC2).

E. K. Cole 2 kW "Thermovent" heater

The heater incorporates a close-mesh protective grille over the air outlet and a guard over the air inlet making it completely safe in use. The element operates at black heat and a warm luminous effect is created by an amber-sprayed 40 W lamp. Attractively designed, the robust metal case of the heater is finished in light hammered bronze stove enamel, with gold-coloured outlet grille and illumination reflector.

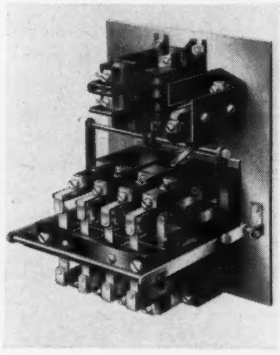
The total weight is 20 lb and the convector is 23in high by 23½in wide by 7½in deep. The switched model (K2) is priced at £7 plus £3 1s 6d purchase tax in the United Kingdom and the thermostatic model (KC2) is £7 10s plus £3 5s 10d tax.

Latched Relays

The latest addition to the "Progress" range of control gear components manufactured by M.T.E. CONTROL GEAR, LTD., Leigh-on-Sea, Essex, is their Type ULR latched relay. Although developed to meet the need for maintaining the operating sequence of machine tools and automation plant, it is equally applicable wherever it is essential to safeguard against the failure of the supply in industrial processes.

The latched relay has the same contact arrangement as the standard multi-pole relay, Type UR1, which provides up to eight poles, normally open or normally closed. A solenoid operated latched gear is incorporated, the coil of which can be made suitable for all standard voltages.

The supply to the relay is fed via the normally closed contact on a micro switch and a coil retaining contact on the relay. Thus in a normal circuit the relay is held in by its own tractive coil, and the latch mechanism is in such a position that should the supply fail the relay is held in. When a pulse is applied to the solenoid, the latch mechanism will clear the relay bridge plate, and at that instant the micro switch contacts will be open, allowing the relay to fall out. By incorporating the micro switch all mechanical wear between the relay bridge plate and the latching mechanism is claimed to be eliminated.



M.T.E. Type ULR latched relay

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) will be obtainable after 23rd October from the Patent Office, 25, Southampton Buildings, London, W.C.2

1953

10115. Electric & Musical Industries, Ltd.—Safety circuits for cathode-ray tubes. 5th April, 1954. (784935.)

24351. Ericsson Telephones, Ltd., and Acton, J. R.—Electronic counting and selecting arrangements. 29th November, 1954. (785021.)

30565. Simplex Electric Co., Ltd.—Electrically heated cooking appliances. 5th November, 1954. (785292.)

33064. Standard Coil Products Co., Inc.—Tuning devices for television receivers. 27th November, 1953. (784936.)

33407. Thorn Electrical Industries, Ltd.—Luminescent materials. 5th November, 1954. (785114.)

1954

4574. General Electric Co., Ltd.—Methods of detecting loose impurities in transparent containers. 16th February, 1955. (785023.)

5427. Ferranti, Ltd.—Electromagnetic field controlling devices. 18th May, 1955. (785212.)

6072. International Business Machines Corporation.—Electronic shifting register and storage circuit therefor. 2nd March, 1954. (784989.)

11396. British Telecommunications Research, Ltd.—High frequency current supply arrangements for use in telecommunication systems. 19th April, 1955. (785027.)

11525. General Electric Co.—Manufacture of compressors. 21st April, 1954. (784937.)

20384. Philips Electrical Industries, Ltd.—Radio receiving circuits comprising means for automatic gain control. 12th July, 1954. (785031.)

20805. Meikle, O., Fiander, L. P., and Andrews, D. J. G.—Electric control devices for furnaces. 18th July, 1955. (785033.)

22463. C-V Prime Movers, Ltd.—Closed circuit turbine power plants. 6th January, 1955. (785035.)

23352. British Telecommunications Research, Ltd.—Electrical counting circuits employing gas-discharge tubes. 27th July, 1955. (785216.)

23904. Igranic Electric Co., Ltd.—Speed regulating and current limit motor control systems. 17th August, 1954. (785036.)

23934. General Electric Co., Ltd., and McKeag, A. H.—Cathode-ray tubes including luminescent screens arranged to emit red light. 17th November, 1955. (785217.)

24287. Igranic Electric Co., Ltd.—Electromagnetic brakes. 20th August, 1954. (785037.)

24518. General Electric Co., Ltd.—Pressure welding. 16th August, 1955. (784939.)

24796. Decca Record Co., Ltd.—Construction of electronic equipment. 22nd August, 1955. (784993.)

25399. Goldstaub, H. H.—Electrical heating apparatus. 26th August, 1955. (784994.)

26638. General Electric Co., Ltd.—Electric spotlights. 1st September, 1955. (785118.)

27297. Cole, Ltd., E. K., and King, A. E.—Manufacture of tuning coils for use in circuits of radio, television and the like. 21st September, 1955. (785219.)

29031. Lucas (Industries), Ltd., J.—Electromagnetically operated observation mirror for use in road vehicles. 3rd January, 1956. (785041.)

29580. Cole, Ltd., E. K., and King, A. E.—Electricity supply arrangements. 16th January, 1956. (785220.)

33827. Soc. d'Electronique et d'Automatisme.—Waveform handling devices for binary coded pulse signalling systems. 22nd November, 1954. (784999.)

1955

195. Philips Electrical Industries, Ltd.—Circuits for detecting an auxiliary carrier lying within the band of a television signal. 4th January, 1955. (785226.)

759. Babcock & Wilcox, Ltd., and Moore, R. V.—Nuclear reactor heated boiler systems. 10th January, 1956. (785050.)

3987. Wilmot-Breeden, Ltd.—Electric light units for use in aircraft. 5th June, 1956.

4276. Lucas (Industries), Ltd., J.—System for effecting automatic control of a vehicle variable speed power transmission mechanism. 2nd February, 1956. (785125.)

4595. Marconi's Wireless Telegraph Co., Ltd.—Electric analogue calculating instruments. 20th October, 1955. (785230.)

6026. Philips Electrical Industries, Ltd.—Cathode-ray tubes for producing images. 1st March, 1955. (785233.)

7265. Metropolitan-Vickers Electrical Co., Ltd.—Contact assemblies for electric circuit-breakers. 9th March, 1956. (785235.)

8071. Simplex Electric Co., Ltd.—Mounting arrangements for thermostats in ovens or other heated enclosures. 19th March, 1956. (785057.)

9764. Philips Electrical Industries, Ltd.—Electroluminescent elements. 4th April, 1955. (785061.)

10102. Siemens-Schuckertwerke Akt.-Ges.—Method and apparatus for preheating feed water in steam power plant. 6th April, 1955. (785062.)

10216. Chamberlain & Hookham, Ltd., Deacon, L. O., and Lewis, H. S.—Protective relay for a 3-phase a.c. distributing system. 2nd March, 1956. (785327.)

10420. Serck Radiators, Ltd.—Air-cooling means for thermionic valves and like discharge tubes. 15th March, 1956. (785065.)

13784. Shell Research, Ltd.—Electric measuring and testing apparatus. 24th February, 1956. (785068.)

14754. Compagnie Générale de Télégraphie sans Fil.—High frequency amplifiers and oscillators. 23rd May, 1955. (785333.)

14805. Eitel-McCullough, Inc.—Ceramic electron tube. 23rd May, 1955. (784952.)

15094. Beck & Co., Ges., Dr.—Insulated wire. 25th May, 1955. (785241.)

19414. Mallory & Co., Inc., P. R.—Electrolytic capacitors. 5th July, 1955. (785077.)

19837. Chromatic Television Laboratories, Inc.—Cathode-ray tube grid units. 8th July, 1955. (785078.)

22755. Mallory & Co., Inc., P. R.—Dry capacitor. 8th August, 1955. (784957.)

26212. Bendix Aviation Corporation.—Magnetic amplifier modulator. 13th September, 1955. (785087.)

26756. Siemens-Schuckertwerke Akt.-Ges.—Electric cable terminations. 19th September, 1955. (785250.)

30161. Standard Telephones & Cables, Ltd.—Radio frequency coupling devices. 21st October, 1955. (785096.)

32752. Erie Resistor Corporation.—Electrical components. 16th November, 1955. (785160.)

32915. Hoover Ball & Bearing Co.—Dish washing apparatus. 17th November, 1955. (785161.)

33058. Westinghouse Electric International Co.—Overspeed protective devices for electric generators. 18th November, 1955. (785162.)

36882. Standard Telephones & Cables, Ltd.—Process of coating cathode-ray tube screens. 23rd December, 1955. (785171.)

1956

3476. General Electric Co.—Regenerative detector circuits. 3rd February, 1956. (785176.)

3627. Philips Electrical Industries, Ltd.—Methods of manufacturing indirectly heated cathodes. 6th February, 1956. (785177.)

4918. Hoover, Ltd.—Steam irons. 16th February, 1956. (785178.)

6113. Standard Telephones & Cables, Ltd. (Nippon Electric Co., Ltd.).—Electron tube magnetic focusing device. 28th February, 1956. (785110.)

8367. Cinch Manufacturing Corporation.—Holder for a thermionic valve electrical plug or other device having projecting terminal prongs. 16th March, 1956. (785273.)

8619. Allmanna Svenska Elektriska Aktiebolaget.—Overvoltage protection device. 20th March, 1956. (Addition to 751443.) (785187.)

9968. General Electric Co.—Rotary electric switches. 29th March, 1956. (784978.)

12549. Busch-Jaeger Durener Metallwerke Akt.-Ges.—Electric ceiling switch. 24th April, 1956. (785275.)

13375. Western Electric Co., Inc.—Apparatus for shaping electromagnetic waveguides. 1st May, 1956. (785199.)

21751. General Electric Co.—Testing of compressors. 13th July, 1956. (784984.)

21920. Freezer compartment for household refrigerators. 16th July, 1956. (785281.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 25th October:—

SILVER GLIDE. No. 766,909. Class 8. Electric shaving instruments and parts.—Sunbeam Corporation, Chicago, U.S.A. Address for service, c/o Frank B. Dehn & Co., Kingsway House, 103, Kingsway, London, W.C.2.

SUBSCRIBER-VISONA. No. 754,661. Class 9. Apparatus for transmitting and receiving coded television programmes.—Skiatron Electronics & Television Corporation, New York, U.S.A. Address for service, c/o Matthews, Haddan & Co., 31 and 32, Bedford Street, Strand, London, W.C.2.

KADORMAX. No. 754,779. Class 9. Electric batteries (not for medical purposes).—Vidor, Ltd., 681, Salisbury House, Finsbury Circus and London Wall, London, E.C.2.

PERMACON. No. 755,427. Class 9. Electrical convertors for use in the ignition systems of internal combustion engines.—Burdin, Baker & Co., 11, Balham Grove, Balham, London, S.W.12.

HARLEQUIN. No. 764,205. Class 9. Electric batteries, cells, accumulators, radio receivers, television apparatus, gramophones and radio-gramophones, record players, and cases for electric torches.—Berec Radio, Ltd., Hercules Place, Holloway, London, N.7.

JANET. No. 764,809. Class 9. Apparatus and instruments for the recording, reproduction, transmission and reception of sound; and television transmitting and receiving apparatus.—C. A. Shepherd, 54, Brown Street, Manchester, 2.

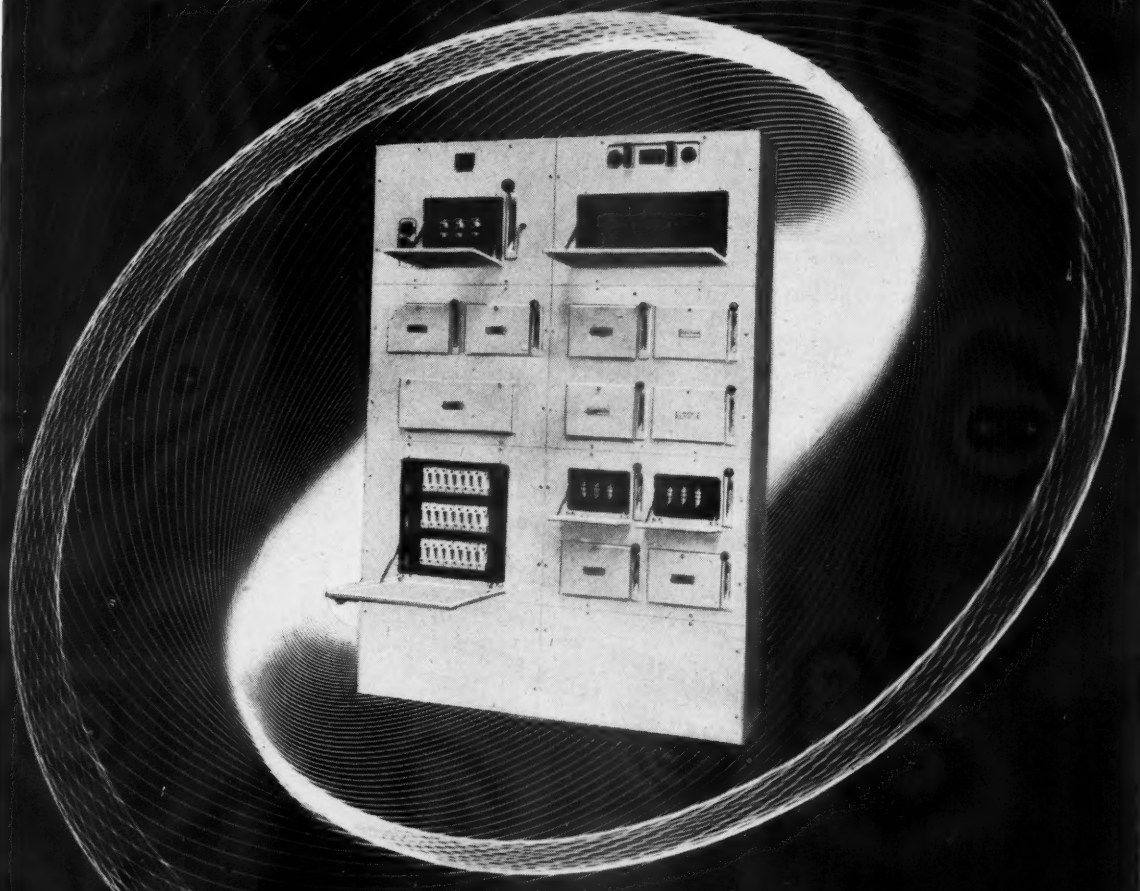
TUGA. No. 767,009. Class 9. Electric welding apparatus (not machines), and parts, and electrodes for use therewith.—Electro-Chemical Research Laboratories, Ltd., 33, Knox Street, Marylebone Road, London, W.1.

POPPET (design). No. 767,125. Class 9. Portable radio sets.—Pilot Radio, Ltd., 31-37, Park Royal Road, London, N.W.10.

INFRAMATIC. No. 764,326. Class 10. Infra-red heating apparatus for surgical and curative purposes; and electric blankets.—N. W. Hirst, 102, Coastal Road, Bolton-le-Sands, Carnforth, Lancs.

CREDA CONSTELLATION. No. 766,697. Class 11. Electric cooking stoves and electric ovens and parts.—Simplex Electric Co., Ltd., Broadwell, Oldbury, near Birmingham.

central power control



Ottermill Cubicle Type Switchboards are the most up-to-date form of centralised power control. Their superior appearance is the outward evidence of the excellent design, workmanship and materials which combine to provide first class performance. The Fuse Switches comply with the requirements of BS. 2510/1954 and BS. 861/1955 and have been ASTA type tested for 35 MVA making capacity.

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BURDETTE'S
Electrical Services

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

Monday, 21st October

BIRMINGHAM.—College of Technology, Gosta Green, 6 p.m. I.E.E., South Midland Supply and Utilisation Group. "Earthing of Low- and Medium-Voltage Distribution Systems and Equipment," by F. Mather.

BRISTOL.—Royal Hotel, 7 p.m. I.E.S., Bath and Bristol Centre. "Lighting as an Effective Aid to Architecture," by H. E. Bellchambers.

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E., Western Supply Group. Chairman's address, by C. W. Priest.

COVENTRY.—Craven Arms, High Street, 7.15 p.m. Institution of Production Engineers, Coventry Group. "Russian Machine Tool Industry," by N. Stubbs and P. Trippe.

IPSWICH.—Electric House, 7.15 p.m. Ipswich and District Electrical Association. "Electricity Supplies in India," by G. N. Green.

LIVERPOOL.—Royal Institute, Colquitt Street, 6.30 p.m. I.E.E., Mersey and North Wales Centre. "Brushless Variable-Speed Induction Motors," by Professor F. C. Williams, E. R. Laithwaite and L. S. Piggott.

NEWCASTLE-UPON-TYNE.—King's College, 6.15 p.m. I.E.E., North-Eastern Radio and Measurements Group. Chairman's address, by W. Gray.

READING.—George Hotel, King Street, 7.15 p.m. I.E.E., district meeting. "An Historical Survey of the Development of Switchgear," by A. Abbott.

Tuesday, 22nd October

BIRMINGHAM.—College of Technology, Gosta Green, 6.15 p.m. I.E.E., South Midland Education Discussion Circle. Discussion on "Co-ordination of the Initial Courses for Engineering Students," opened by Prof. D. G. Christopherson.

Birmingham Exchange and Engineering Centre, 7 p.m. Institute of Physics, Midland Branch, "The Physicist in the Atomic Energy Authority (Industrial Group)," by L. Rotherham.

CAMBRIDGE.—Technical College, 6 for 6.30 p.m. I.E.E., East Anglian Sub-Centre. "Engineering Education in the Soviet Union," by G. S. C. Lucas.

CARDIFF.—At the South Wales Engineers' Institute, Park Place, 7.15 p.m. Incorporated Plant Engineers, South Wales Branch. "Methods of Mechanical Application," "Reclamation of Oil," and "Conservation of Grade." Films and discussion.

COVENTRY.—Coventry Electricity Sports and Social Club, Merrick Lodge, St. Nicholas Street. Coventry Electric Club. "Mineral Insulated Cables for Wiring and Heating," by R. J. Cotton.

EDINBURGH.—Little Theatre, 60, Pleasance, 7.30 p.m. Edinburgh Electrical Society. "Utilisation of Electricity in the Atomic Age," by J. Cogan.

GLOUCESTER.—Fleece Hotel, Westgate Street, 6.30 p.m. I.E.S., Gloucester and Cheltenham Centre. "Home Lighting."

LEEDS.—C.E.A., 1, Whitehall Road, 1, 7 p.m. I.E.E., North Midland Graduate and Student Section. "Harmonics in Discharge Tube Circuits," by W. Waring and J. Lofts.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E., Measurement and Control Section. "The Measurement of High Voltages with Indicating or Recording Instruments," by G. W. Bowdler.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E., North-Western Measurement and Control Group. "A Deep Electrolytic Tank for the Solution of 2- and 3-Dimensional Field Problems in Engineering," by E. R. Hartill, J. G. McQueen and P. N. Robson.

NOTTINGHAM.—College of Arts and Crafts, Waverley Street, 6.30 p.m. I.E.E., East Midland Centre. "Mechanical Strength of Power Transformers in Service," by E. T. Norris.

Tuesday, 22nd October, to Friday, 25th October

LONDON.—Olympia. Dairy Show.

Wednesday, 23rd October

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E., Supply Section. Chairman's address, "Too Much and Too Little," by Professor M. G. Say.

NOTTINGHAM.—East Midlands Electricity Board's Showroom Theatre, Smithy Row, 7.30 p.m. A.S.E.E., Nottingham Branch. Annual films evening.

RUGBY.—Rugby College of Technology and Arts, 6.30 p.m. I.E.E., Rugby Sub-Centre. "Electricity in Agriculture," by J. T. Taylor. (Joint meeting with the Rugby Engineering Society.)

STAFFORD.—Technical College, 7.15 p.m. I.E.E., North Staffs. Graduate and Student Section. "Short Circuit Testing of Electrical Equipment," by G. E. Moreton.

Thursday, 24th October

CHATHAM.—Medway College of Technology, 7 p.m. I.E.E., London Graduate and Student Section. District meeting. Repeat of chairman's address.

CHELMSFORD.—Hoffmann's Social Hall, 7.30 p.m. Chelmsford Engineering Society. "Aluminium in the Electrical Engineering Industry," by D. Worth.

CROYDON.—Greyhound Hotel, High Street, 8 p.m. A.S.E.E., South London Branch. "Electrical Installations in Ships," by C. J. Penny.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E., Utilisation Section. "The Post-War Electrification of the Polish State Railways," by J. Podoski.

College of Preceptors, Bloomsbury Square, W.C.1, 7 p.m. Incorporated Plant Engineers, London Branch. "Complexity of Plant and the Training of Operatives," by N. D. Pirrie.

At the English Electric Co., Ltd., Queen's House, Kingsway, W.C.2, 6 p.m. Electrical Association for Women, London Branch. "The Push Button Era in the Home," by A. M. Parkinson.

Grosvenor House, W., 7.15 for 8 p.m. Gauge and Tool Makers' Association. Annual dinner-dance.

Thursday, 24th October, to Sunday, 27th October

EASTBOURNE.—Scientific Instrument Manufacturers' Association. Convention.

Friday, 25th October

BIRMINGHAM.—Regent House, St. Philip's Place, Colmore Row, 6 p.m. I.E.S., Birmingham Centre. "Horticultural Lighting," by A. W. Gray.

Pavilion Suite, County Ground, Edgbaston, 6.30 for 7 p.m. Electrical Trades' Commercial Travellers' Association, Midlands Branch. Annual dinner.

BRISTOL.—Grand Hotel. Incorporated Plant Engineers, Western Branch. Annual dinner.

COVENTRY.—Hotel Leofric. Incorporated Plant Engineers, Birmingham Branch. Annual dinner-dance.

HATHERSAGE.—Millstone Inn, 7.30 p.m. A.S.E.E., Sheffield Branch. Annual dinner and dance.

LONDON.—Great George Street, Westminster, S.W.1, 7.30-11.30 p.m. Institution of Civil Engineers Graduates' and Students' Conversazione.

MANCHESTER.—Engineers' Club, Albert Square, 6.45 p.m. Manchester Association of Engineers. "Brittle Fracture," by G. M. Boyd.

NEWCASTLE-UPON-TYNE.—King's College, 6.30 p.m. I.E.E., Tees-Side Graduate and Student Section. "Measurement and Control in Chemical Processes," by M. S. Beck.

RUGBY.—A.S.E.E., Coventry Branch, 8 p.m. Visit to English Electric Co., Rugby Works.

WEYMOUTH.—South Dorset Technical College, 6.30 p.m. I.E.E., Southern Centre. "The Transatlantic Telephone Cable," by R. J. Halsey.

Saturday, 26th October

NEWCASTLE-UPON-TYNE.—I.E.E., North Eastern Graduate and Student Section. Visit to Reyrolle Research Station (10 a.m.).

Nigerian Corporation's Report

At the end of March last year the Electricity Corporation of Nigeria had an accumulated deficit of £510,290 which included a loss during the year then ended of £405,437. Measures were taken to remedy the situation and in its report for 1956-57 just issued the Corporation records a considerable improvement in its affairs. Income amounted to £2,556,494, an increase of £694,930, and there was a net operating profit of £17,511. After deducting £5,580 in respect of previous years and writing off £8,783 preliminary expenses incurred during the formation of the Corporation there was a loss of £63. During the year a sum of £290,500 was reimbursed by the Federal Government and the balance of £219,790 outstanding at the close of the year has since been paid. A major retrenchment programme was carried out, staff being reduced to the minimum.

Electricity sales in 1956-57 rose by nearly 18 per cent to 158·3 million kWh. A hire scheme for cookers, water heaters and ceiling fans launched in June, 1956, is said to be operating satisfactorily. A hot-plate specially designed for the Nigerian market is being introduced as well as a simplified harness wiring installation unit suitable for one or two rooms which will be available at an inclusive rental of 2s a month.

Some 85 MW of plant was in commission at the end of the year and the aggregate maximum demand was 43·3 MW. This apparently low utilisation of plant is explained by the isolated nature of many of the undertakings, necessitating a high ratio of stand-by plant, and the commissioning of larger units of Ijora "B" and Oji River stations. There is, in fact, insufficient spare plant at a number of undertakings and if sets are out of service a certain amount of load shedding is necessary.

Dr. Eni Njoku was appointed chairman of the Corporation in December, 1956. Mr. J. L. King, O.B.E., M.I.E.E., is the general manager.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia.—Sydney County Council. 9th January. Solenoid mechanisms for oil circuit-breakers. (E.S.B. 24064-5/57. Ten/28498-9.)*

Electricity Commission of New South Wales, Sydney. 31st October. Galvanised steel earth wire. (E.S.B. 24003/57. Ten/28422.)*

Stores and Contracts, Postmaster General's Department, Melbourne. 5th December. Current transformer and electrical indicating meters. (E.S.B. 24013/57. Ten/28421.)*

Belfast.—Corporation. 15th November. Electric goods lift and electrical installation in power station workshop and administration buildings. (See this issue.)

Eston.—U.D.C. 4th November. Street lighting equipment. (See this issue.)

Formosa.—Central Trust of China, Taipei. 8th November. 15 ton truck equipped with 10 kVA gasoline engine generator, and air conditioning equipment. (E.S.B. 24269/57. I.C.A. Ten/28456.)* Telephone equipment. (E.S.B. 24268/57. I.C.A. Ten/28453.)*

Fylde.—R.D.C. 28th October. 42 units of 80 W lamps and lanterns in the parish of Hardhorn-with-Newton. Surveyor, 29a, Station Road, Kirkham, near Preston.

Ince-in-Makerfield.—U.D.C. 31st October. 30 group "A" concrete lighting columns, complete with sodium lanterns and ancillary equipment, Platt Bridge. Surveyor, Town Hall.

India.—Damodar Valley Corporation, Calcutta. 31st October. Pumps for Durgapur thermal power station and Bokaro power station extension. (E.S.B. 23850/57. Ten/28419.)* 22nd November. Coal handling system at Durgapur power station. (E.S.B. 24179/57. Ten/28468.)*

Madras State Electricity Board. 28th October. 11 kV and 22 kV distribution transformers. (E.S.B. 24196/57. Ten/28443.)*

Director General of Supplies and Disposals, New Delhi. 25th October. Steel tubular poles. (E.S.B. 24287/57. Ten/28475.)* 29th October. Switchboard cables. (E.S.B. 24098/57. Ten/28420.)*

Iraq.—Directorate General of Posts and Telegraphs. 15th November. Galvanised steel telephone poles. (E.S.B. 23660/57. Ten/28400.)*

Lebanon.—Ministére des Travaux Publiques, Beirut. 8th November. Multi-channel magnetic recording equipment. (E.S.B. 23481/57. Ten/28506.)*

Londonderry.—R.D.C. 1st November. Two electrically driven 7½ m.g.d. rotary self-cleaning screening units and accessories, provision to be made for a future similar screening unit, Faughan pumping station. Binnie, Deacon and Gourley, consulting engineers, Artillery House, Artillery Row, Westminster, S.W.1.

New Windsor.—Corporation. 20th November. Electrical installations in 11 flats at Cross Oak, Dedworth Road. Borough engineer, Kipling Building, Alma Road, Windsor.

New Zealand.—G.P.O., Wellington. 18th November. Radio equipment, including transmitters, receivers, etc. (E.S.B. 24023/57. Ten/28426.)* 12th November. Radio valves. (E.S.B. 24311/57. Ten/28464.)* 19th November. Coaxial cable, joint protection boxes, etc. 20th November. Power cable. (E.S.B. 24021-2/57. Ten/28427-8.)*

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

Pakistan.—Posts and Telegraphs, Karachi. 2nd November. Twenty rectifiers. (E.S.B. 24051/57. Ten/28406.)*

Peterborough. — Corporation. Electrical installations in 124 houses. (See this issue.)

Rhyl.—U.D.C. 1st November. Street lighting equipment. Engineer and surveyor, Council Offices, Clwyd Street.

South Africa.—City Council of Pretoria. 29th October. 11·5 kV, 250 MVA switchgear. (E.S.B. 24071/57. Ten/28424.)*

Stores Department, South African Railways, Johannesburg. 22nd November. Carrier cable equipment. (E.S.B. 23979/57. Ten/28477.)*

Thornaby-on-Tees (Yorks).—Town Council. 25th October. Electrical work in 50 houses on the Village Green housing estate. Borough engineer, Town Hall.

ORDERS PLACED

Dagenham.—Corporation Highways and Works Committee. Accepted. Wiring on the Marks Gate Estate (£4,099).—Evans & Shea, Ltd.

Durham.—County Education Committee. Electrical installations in schools:—Bishop Auckland Woodhouse Close Modern School (£8,400).—Steels Engineering Installations. Felling Leam Lane Lingey House Junior and Infants' School (£3,066).—T. Mitchelson. Felling Leam Lane Roman Road Junior and Infants' School (£3,074).—A. S. Lowrey, Consett Technical College (£4,670).—William Brothers. Jarrow Grammar Technical School (£7,062).—T. Mitchelson. Willington County School (£1,062).—J. Paterson & Co.

Edmonton.—Housing and Building Committee. Passenger lifts for Snells Park redevelopment (£5,724).—Hammond & Champness.

Luton.—Education Committee. Recommended. Electrical installation work at Stopsley Secondary School extension (£3,642) and rewiring of Dunstable Road Junior School (£1,295).—Shoolbred Electrical Co.

Northumberland.—Education Committee. Rewiring of Ashington Hirst East Secondary School (£2,625).—J. R. Tweedy, Rothbury.

Willesden.—Corporation. Recommended. Erection of columns and the installation of lanterns and electrical equipment for lighting in the Harrow Road (£14,107).—Revo Electric Co.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Accrington.—Holy Family R.C. Secondary School; Farebrother & Partners, architects, 99, Seymour Grove, Trafford Bar, Manchester.

Atherstone.—Memorial hall; H. N. Jepson & Partners, architects, Newdegate Place, Nuneaton.

Bathampton.—Primary school; R. O. Harris, county architect, Park Street, Taunton.

Billingham-on-Tees.—Houses (82); U.D.C. surveyor.

Birmingham.—Theatre, Smallbrook Street, for Moss Empires, Ltd.; Hattrell & Partners, architects, 1, Queens Road, Coventry.

Blocks of eight-storey flats at Bushwood Road, Weoley Castle, etc., and four-storey maisonnettes (52) and houses (25), Eastway Farm, Rubery; A. G. Sheppard Fidler, city architect, Civic Centre, 1.

Boston.—(a) 88 houses and 10 bungalows, and (b) 32 bungalows, on the Woad Farm estate; C. L. Hoffrock Griffiths, town clerk, Municipal Buildings, Boston, Lincs.

Brighton.—Primary school at Saltdean; borough surveyor.

Bristol.—Mill extensions; Spillers, Ltd., The Docks, Avonmouth.

Coventry.—Circular café in central area adjoining Woolworth building; city architect, Bull Yard.

Darlington.—Bus station; United Bus Co., Ltd., Darlington.

Extensions to grammar school (£96,691); borough architect.

Exeter.—Police headquarters and courthouse (£160,790); T. B. Keate & Co., builders, Topsham Road, Exeter.

Finchley.—Showrooms, offices and workshops; Leaver, Hembling & Perry, Ltd., 169/175, High Road, London, N.2.

Gateshead.—Factory and offices, Team Valley trading estate, for Kavli & Co.; John Jackson & Sons, contractors, Corporation Street, Newcastle-on-Tyne.

Great Yarmouth. — Theatre at New Britannia Pier; H. A. Holmes & Son, Ltd., builders, South Ice House Hill, Gorleston.

Kirkcaldy.—Houses (88); burgh engineer, Town House.

Leeds.—Comprehensive school, Holbeck; city architect, Priestley House, Quarry Hill, 9.

London. — Office block, Moorfields; Trehearne & Norman, Preston & Partners, architects, 83, Kingsway, W.C.2.

Workshops, offices and laboratories, Pear Tree Wharf, Horn Lane, Greenwich; Huckle & Durkin, architects, 30, Queen Anne Street, W.1.

Multi-storey offices, Edgware Road and Marylebone Road, St. Marylebone; McLaughlan & Harvey, Ltd., builders, 24, Highbury Grove, N.5.

Offices for the Lambeth Housing Department, Brixton Hill/Porden Road corner site (£40,000); J. Brandon-Jones, architect, Redington Road, Hampstead, N.W.3.

Manchester.—Terminal building for city airport; city architect.

Extensions; Phillips Rubber Manufacturing Co., Ltd., Dantzic Street.

Northampton.—Extensions to Spencer Secondary Modern Schools (£73,982); W. Cockerill & Sons, builders, 7, Milton Street.

Northumberland. — County secondary school at Gosforth (£115,000); Cussins (Contractors), Ltd., The Drive, Gosforth.

Peterborough.—Occupation centre at Dogsthorpe (£19,841); Granville Building Co., Ltd., Russell Street, Peterborough.

Houses (84) and flats (12), Paston Ridings estate; city architect, Bridge Street.

Sunderland.—Extensions to works; George Clark, Ltd.

Swansea.—First stage of new General Hospital, Singleton Park (£405,000); Wm. Cowlin & Sons, Ltd., builders, 113, Cathedral Road, Cardiff.

Willesden.—Houses (51), Canterbury Road site; borough engineer, Town Hall, Dyne Road, Kilburn, N.W.6.

Wilton (Yorks).—Additional plant for the production of "Terylene" for Imperial Chemical Industries, Ltd.

Windsor.—Factory, Vale Road, for Pantak, Ltd., Slough; C. B. M. Smith, architect, 4, Bath Road West, Slough.

Worthing.—Methodist church, Offington Park; Graeme I. C. Highet, architect, 9, Quarry Street, Guildford.

Dwellings (64), Limbrick Lane; borough engineer.

Wrexham.—Maternity and child welfare clinic at Queens Park; county architect, Grove Park, Wrexham.

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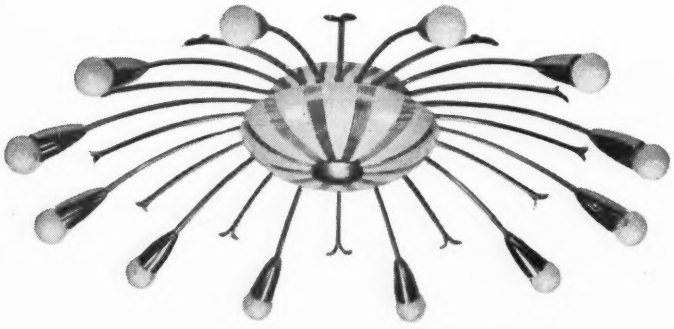

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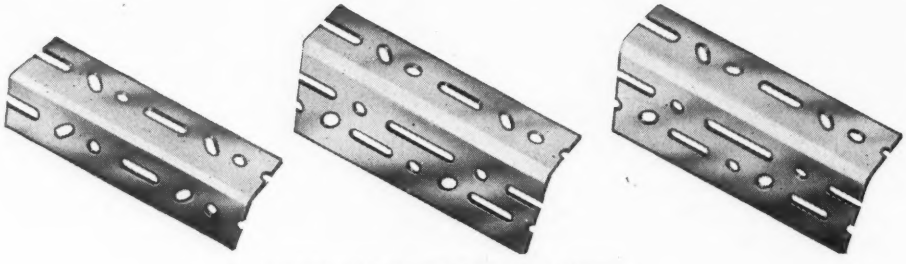

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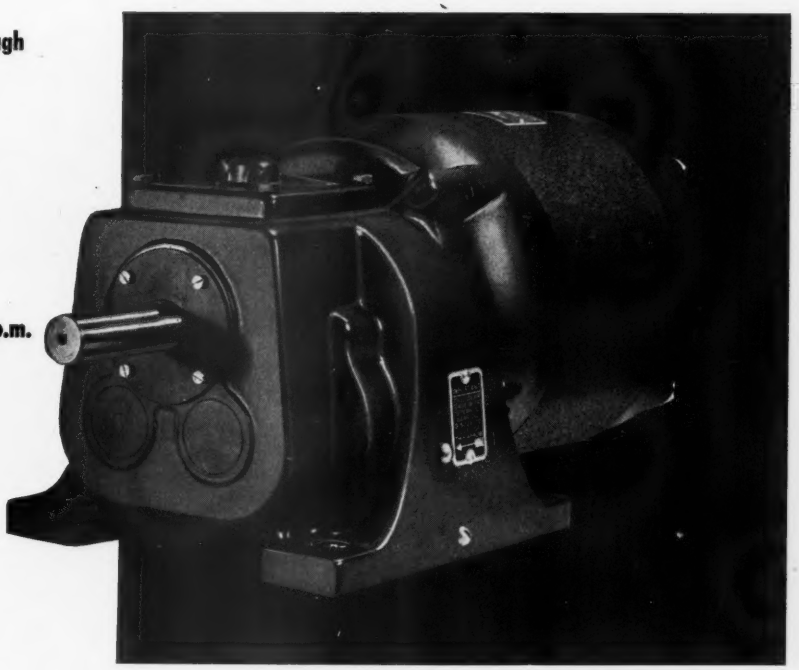

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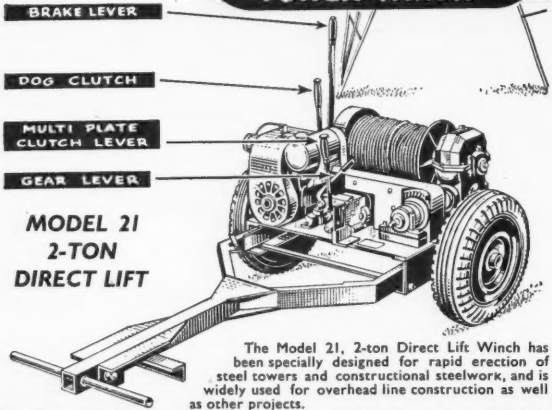

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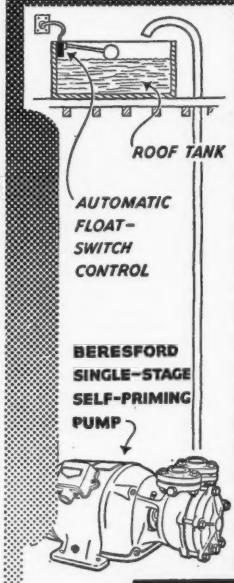

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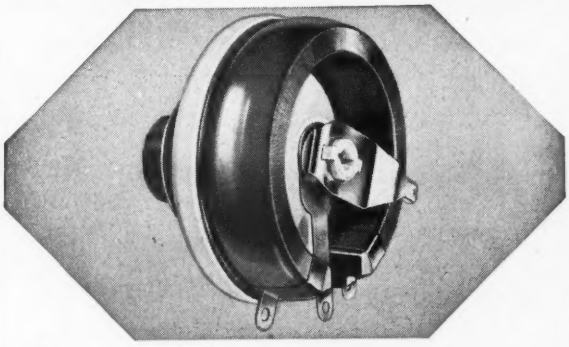

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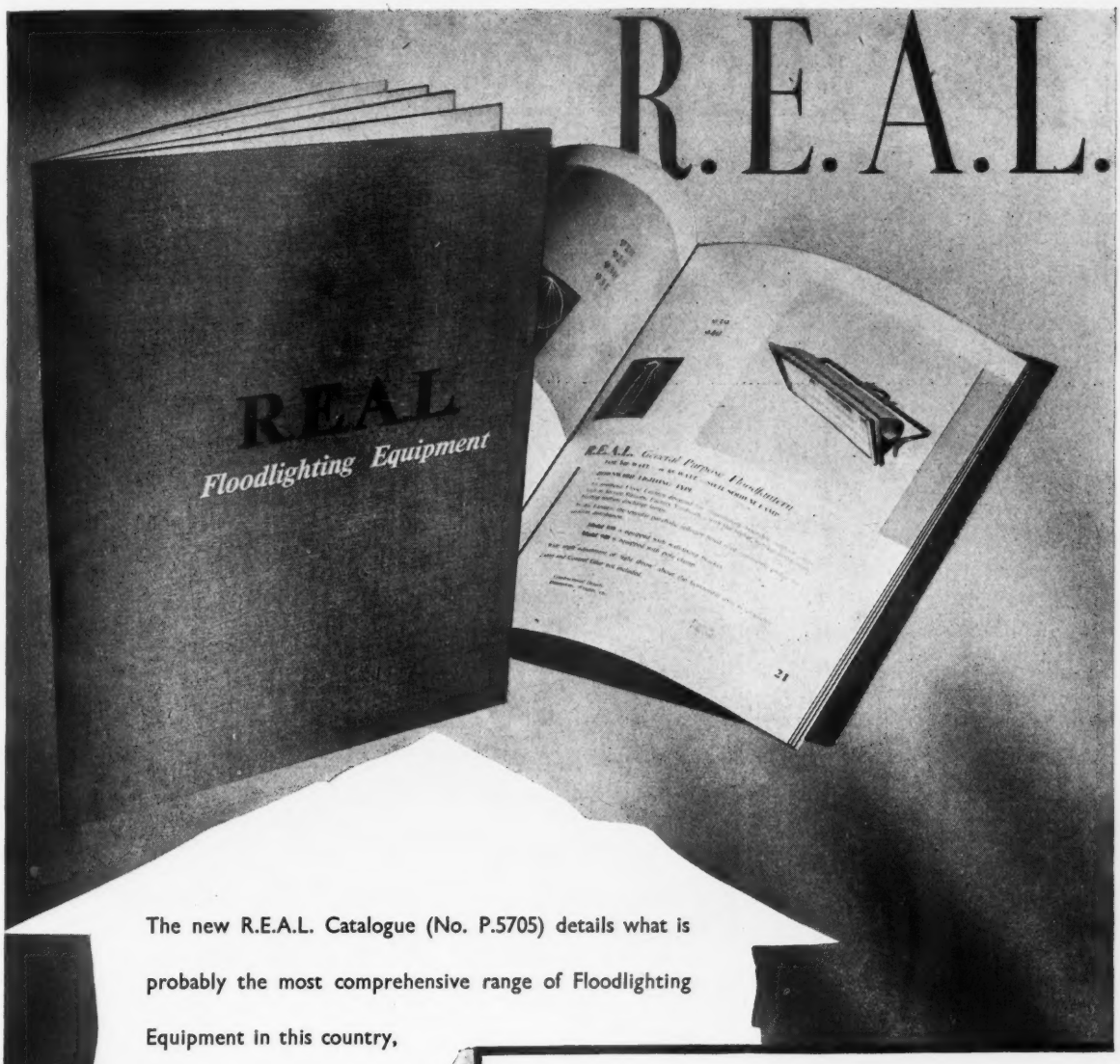

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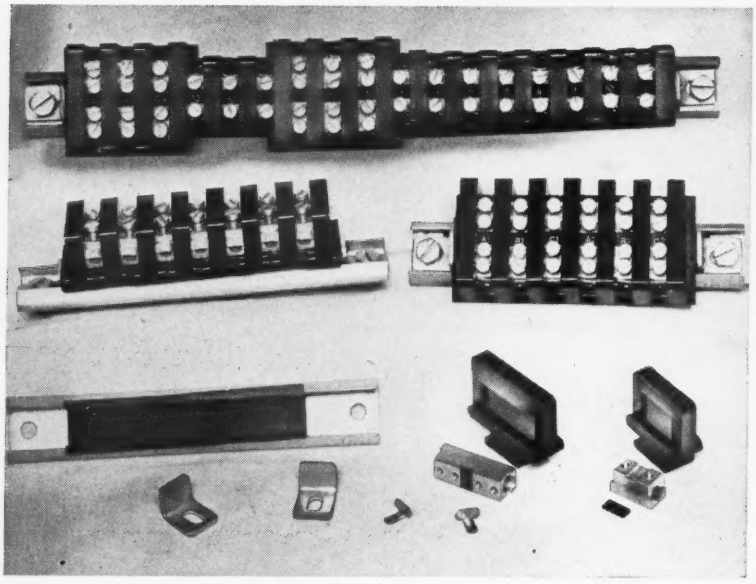

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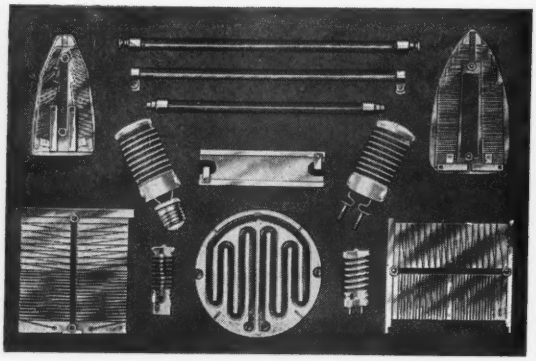

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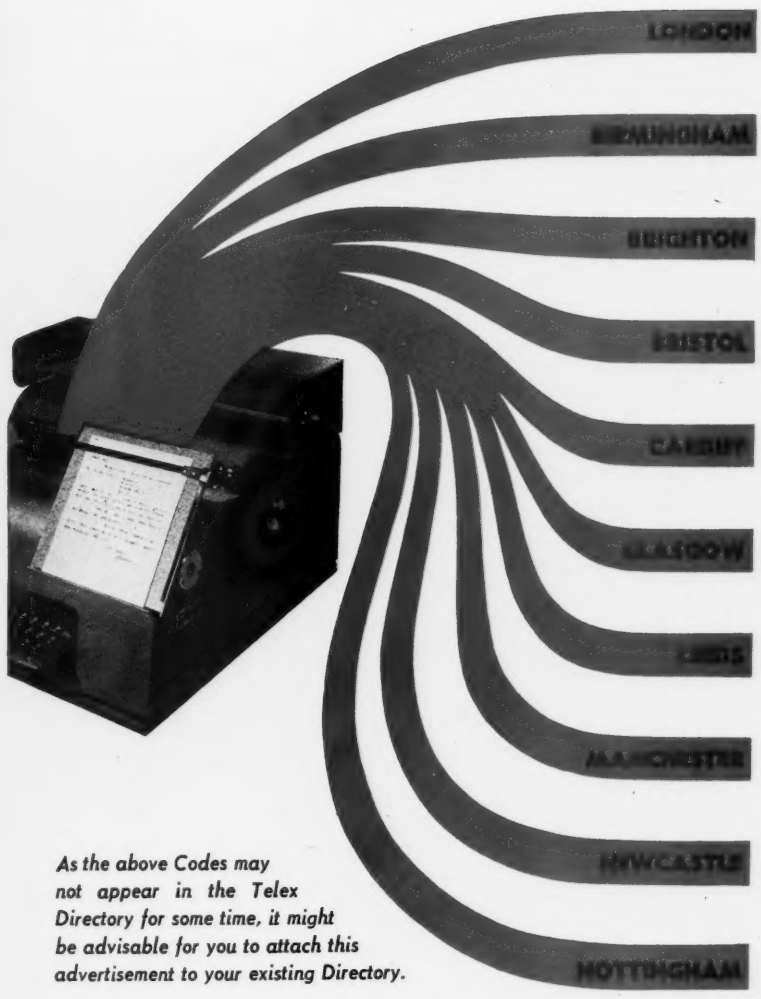

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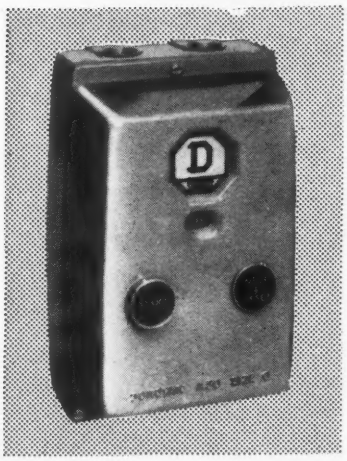

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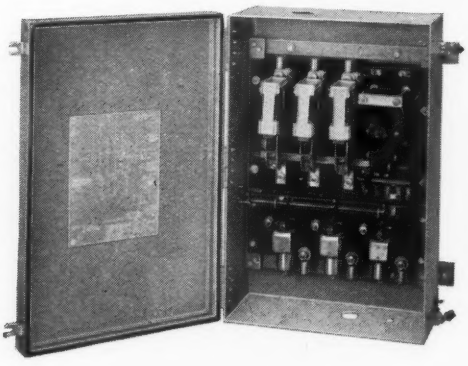

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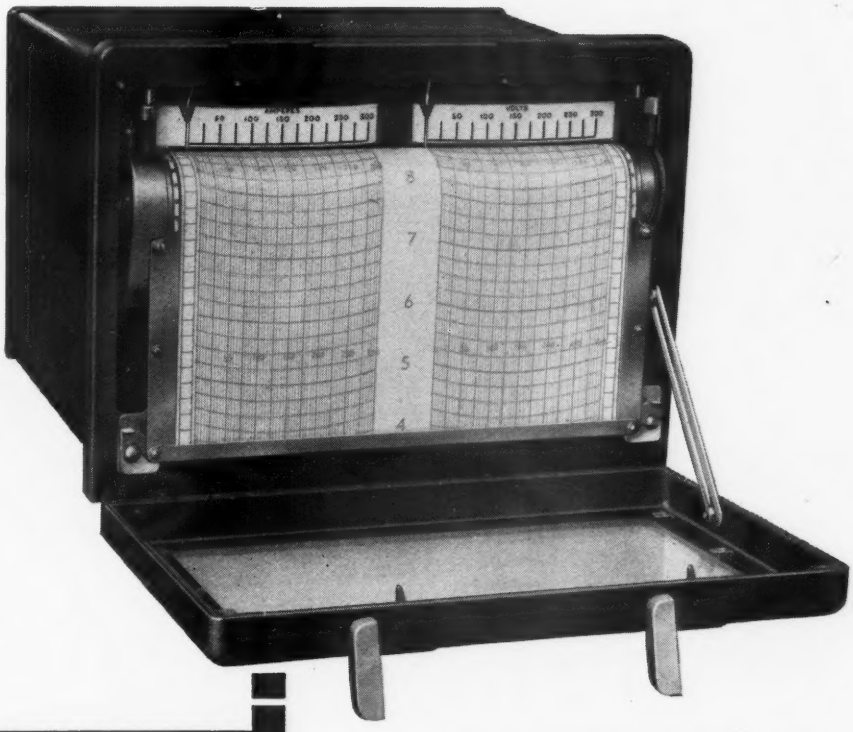

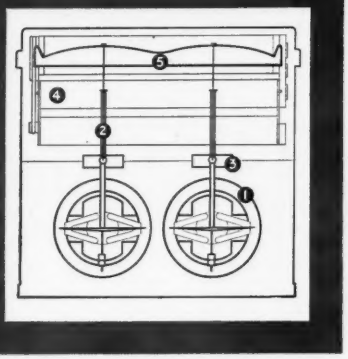

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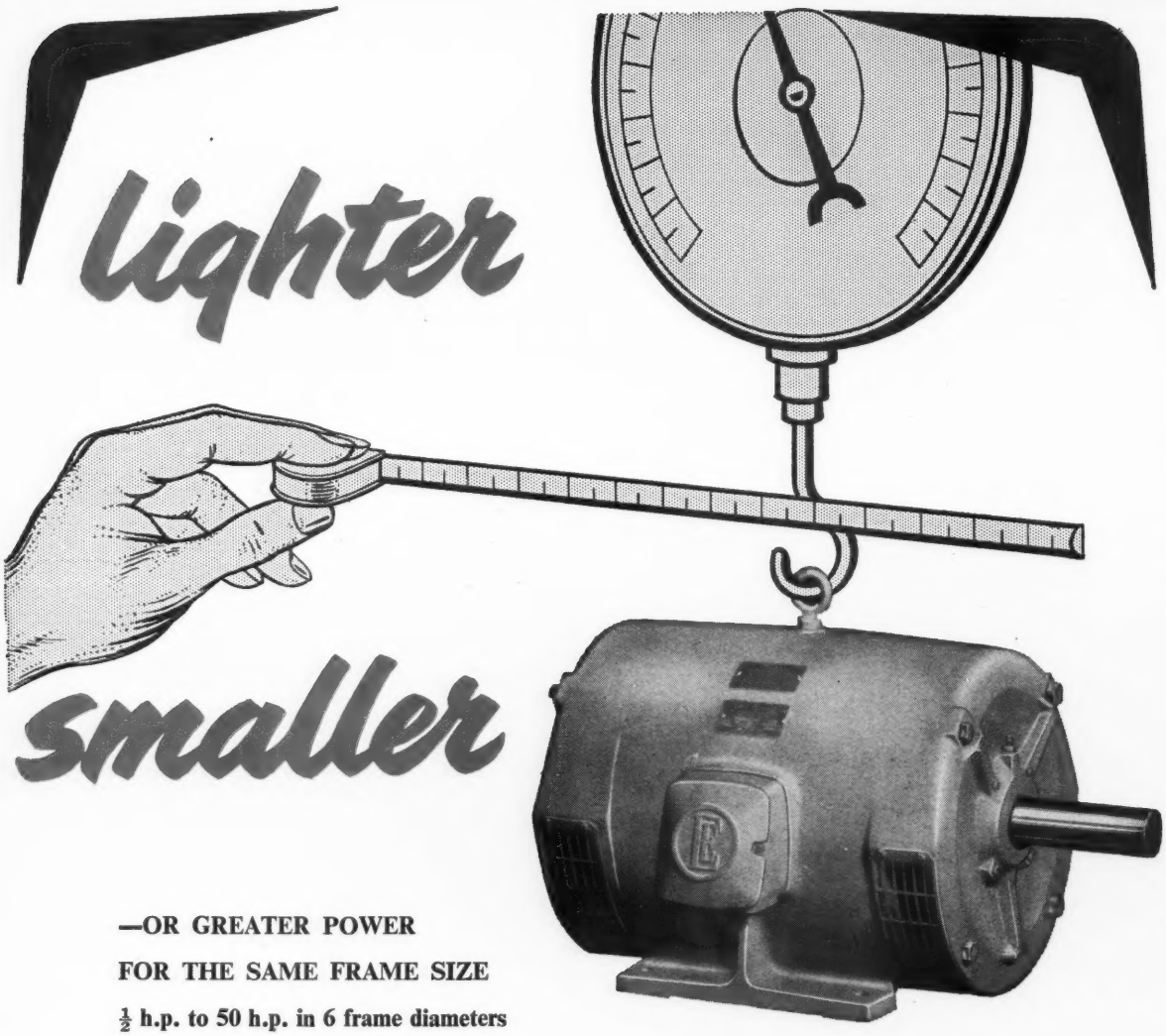


—OR GREATER POWER

FOR THE SAME FRAME SIZE

½ h.p. to 50 h.p. in 6 frame diameters

Most sizes AVAILABLE FROM STOCK

The new range of 'ENGLISH ELECTRIC' ventilated motors have standard fixing dimensions to the new B.S. draft specification CW(ELE) 6246 and they use class 'E' insulation, which permits a temperature rise of 65°C on 40°C ambient temperature. The result for a given horsepower is a lighter, smaller and less expensive motor.

'ENGLISH ELECTRIC'

B.S.D ventilated motors

THE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2

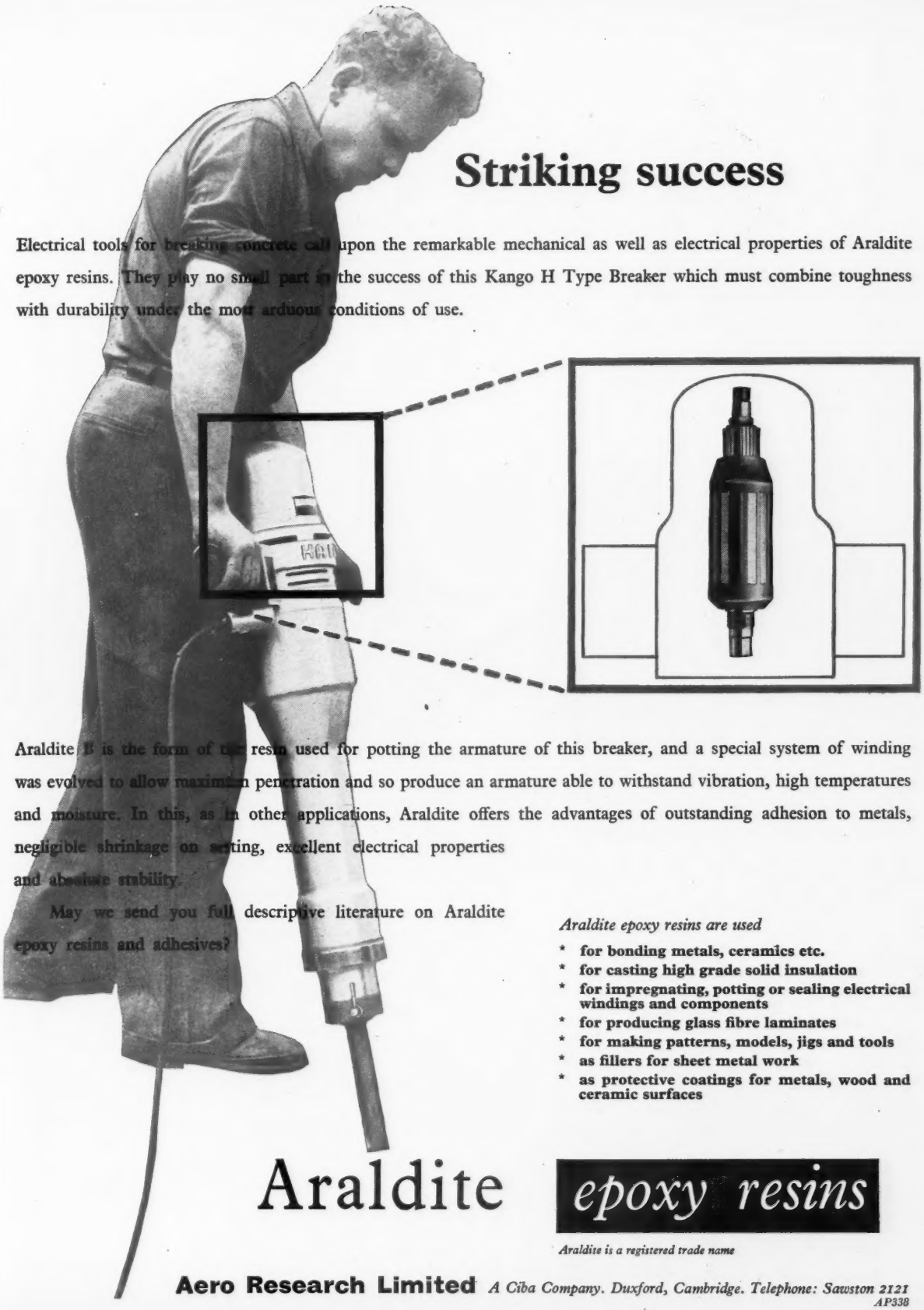
Industrial Motor Works, Bradford

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

DM.6517

Striking success

Electrical tools for breaking concrete call upon the remarkable mechanical as well as electrical properties of Araldite epoxy resins. They play no small part in the success of this Kango H Type Breaker which must combine toughness with durability under the most arduous conditions of use.



Araldite B is the form of the resin used for potting the armature of this breaker, and a special system of winding was evolved to allow maximum penetration and so produce an armature able to withstand vibration, high temperatures and moisture. In this, as in other applications, Araldite offers the advantages of outstanding adhesion to metals, negligible shrinkage on setting, excellent electrical properties and absolute stability.

May we send you full descriptive literature on Araldite epoxy resins and adhesives?

Araldite epoxy resins are used

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- **for making patterns, models, jigs and tools**
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epoxy resins

Araldite is a registered trade name

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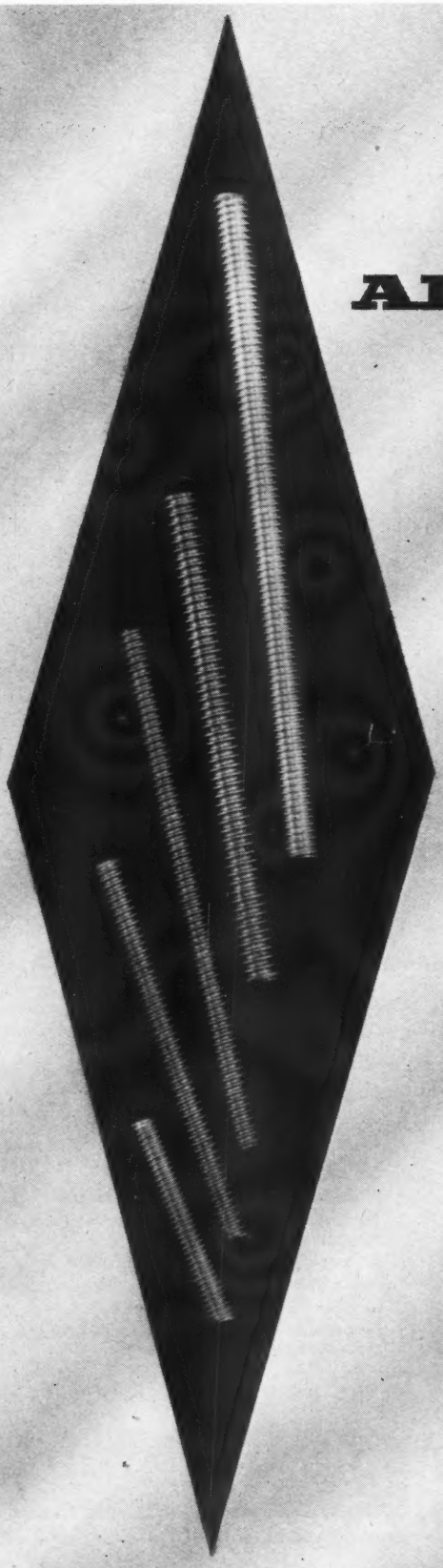
AP338



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Telephone: TERminus 2888

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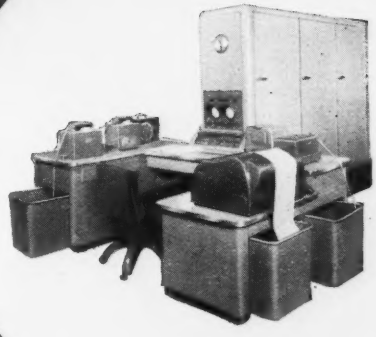
MAGNETIC TAPE EQUIPMENT

for attachment to the FERRANTI PEGASUS COMPUTER



Ferranti Ltd. have developed magnetic tape equipment for attachment to the standard Pegasus Computer, thereby equipping the machine for a new range of scientific and administrative calculations.

For further information on this development, write:-

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LONDON COMPUTER CENTRE: 21 PORTLAND PLACE, W.1. Telephone: LANgham 9211

Works: WEST GORTON · MANCHESTER 12

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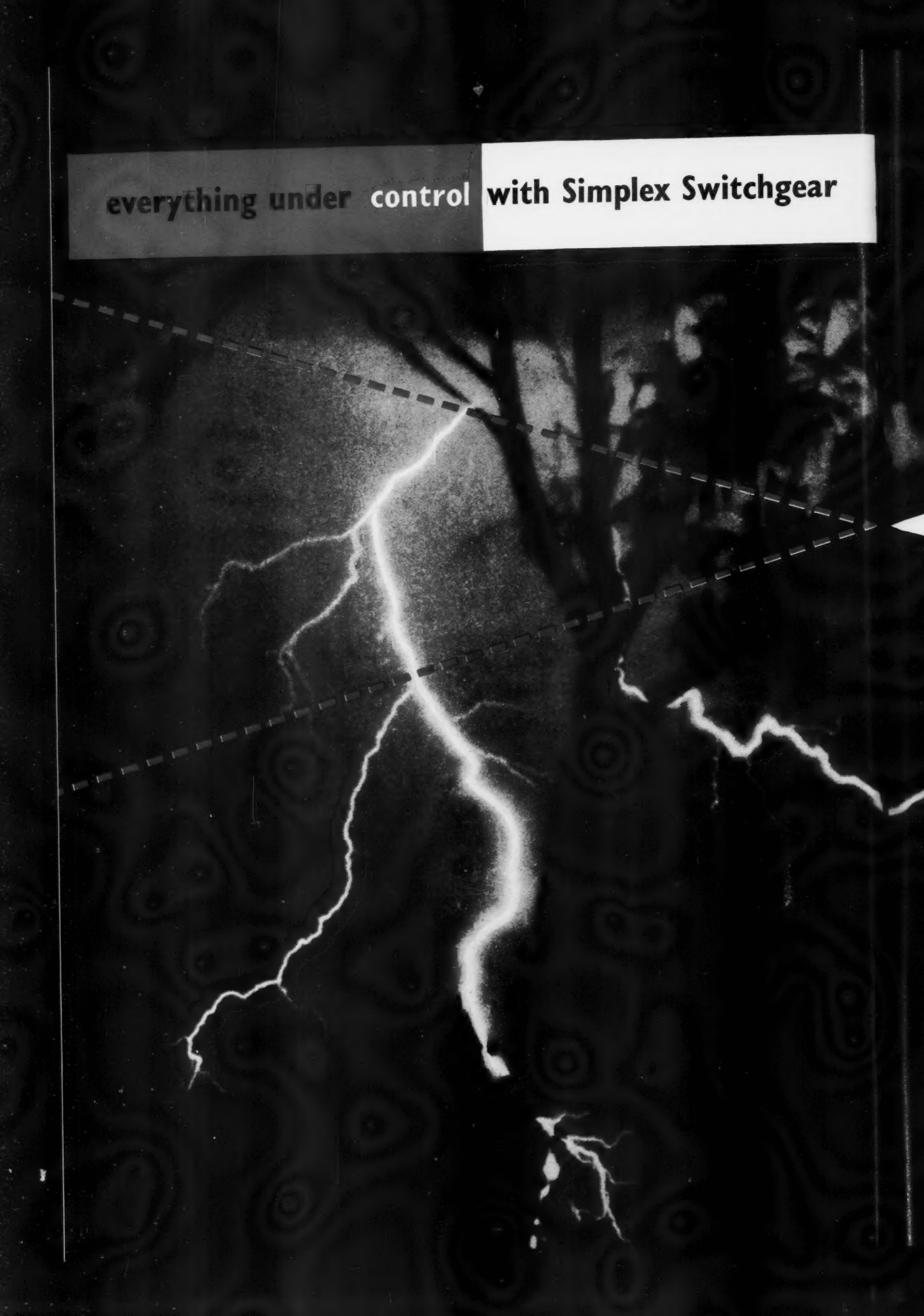
everything under control with Simplex Switchgear

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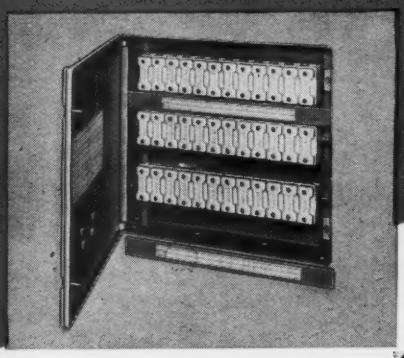
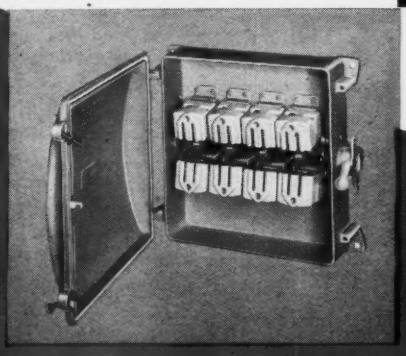
Meteorology comes within the scope of the observations of scientists of more than 50 nations throughout the International Geophysical Year.



One side of the picture — the explosive fury of power uncontrolled.

And the other side? Simplex Switch and Fuse Gear. The ideal means of controlling, protecting, directing, channelling electricity. Ideal, because Simplex take a workmanlike view of switchgear: use the best of the most suitable materials and methods. Produce a job that looks as good as it is. And above all — Simplex design for the man on the job — plan for utmost ease of installation.



it's the installed cost that counts!

cut costs and specify

switch and fuse gear by

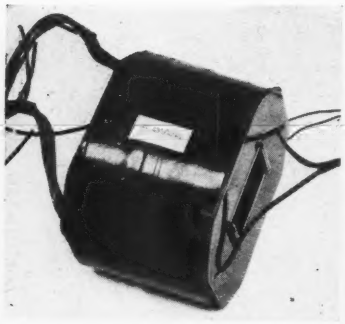
Simplex

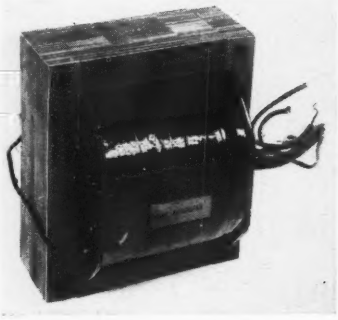
Simplex Electric Co Ltd Oldbury Birmingham

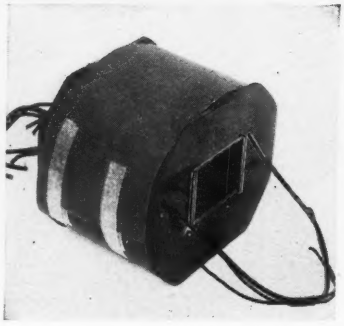
Branches throughout Britain and agents throughout the world A COMPANY

I was *shocked!*
(said Timothy Tapir)

Tim Tapirs long enquiring snout
As Tapirologists agree
Is not designed to root about
The realms of 'electricitee'







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Where Ohm's law is applicable
Use DILEC Tape for Tapir's sake
And make him more amicable.

DILEC tape has been specially developed for the electrical industry.

DILEC is imperishable—**there is no adhesive liable to breakdown or perish** under severe atmospheric or other conditions. It is non-inflammable, will not cone or telescope, is impervious to moisture and is highly resistant to most acids, chemicals, atmospheric conditions etc.

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...take a tip from Timothy Tapir

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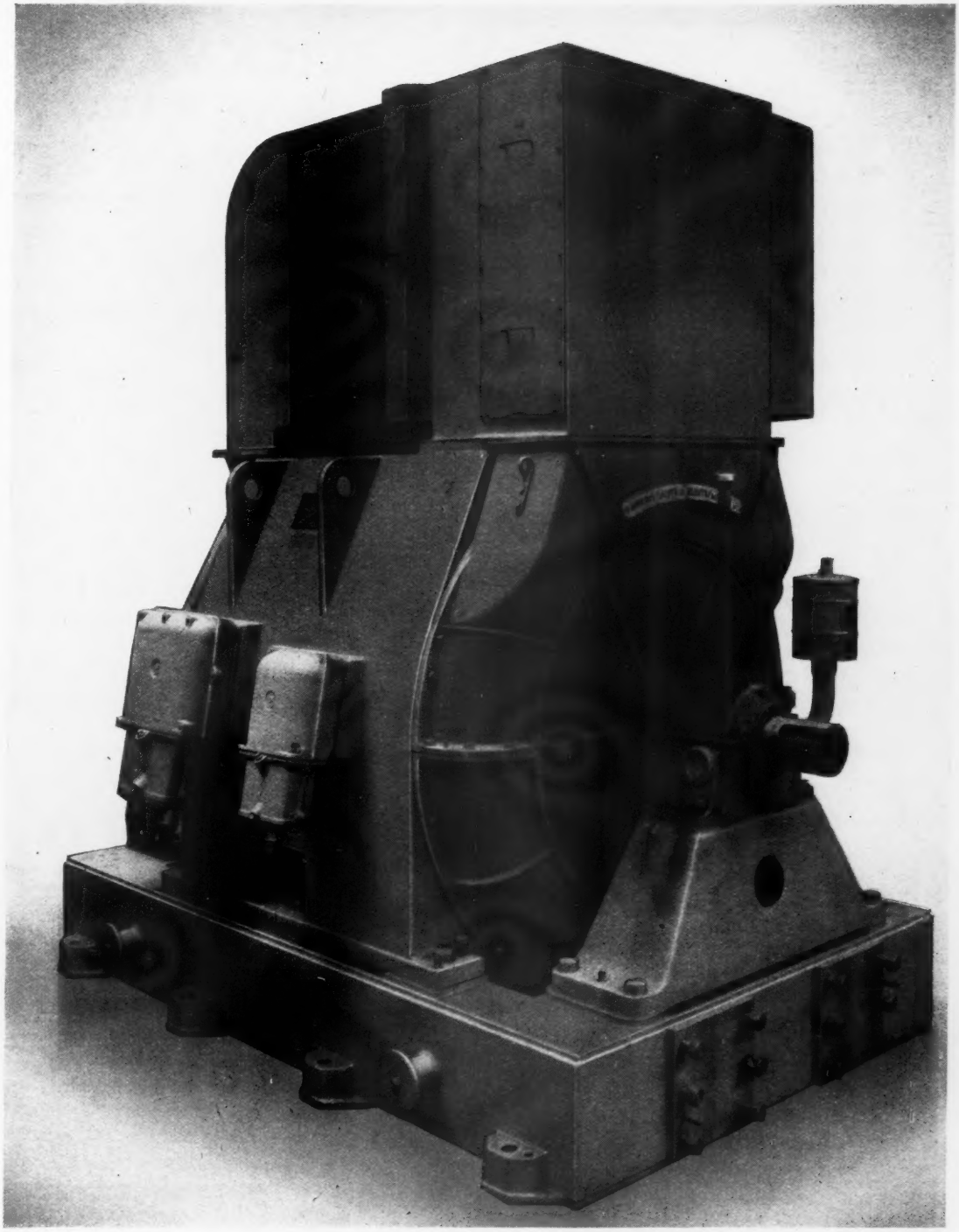

The N-S VARIABLE SPEED a.c. MOTOR is available in all standard enclosures and for speeds, speed ranges and outputs to cover the great majority of requirements, now and in the foreseeable future.

N-S variable speed a.c. motor, 860/57 h.p., 790/316 r.p.m., weatherproof enclosure with air/air heat exchanger, for I.D. fan drive, Willington power station.

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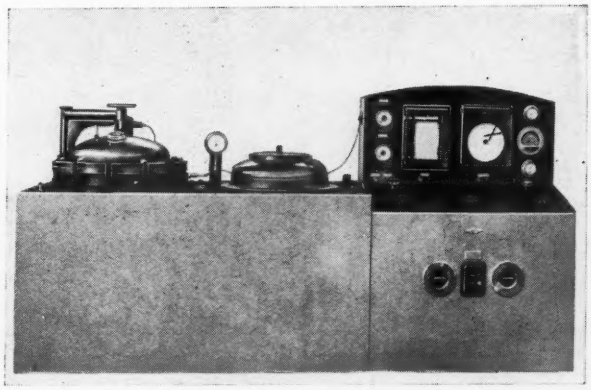
BLICKVAC products include :- Epoxy Resin Vacuum Mixing and Casting Plants, Electric Ovens, Vacuum Ovens, Mixing Vessels, Dipping Tanks, etc.



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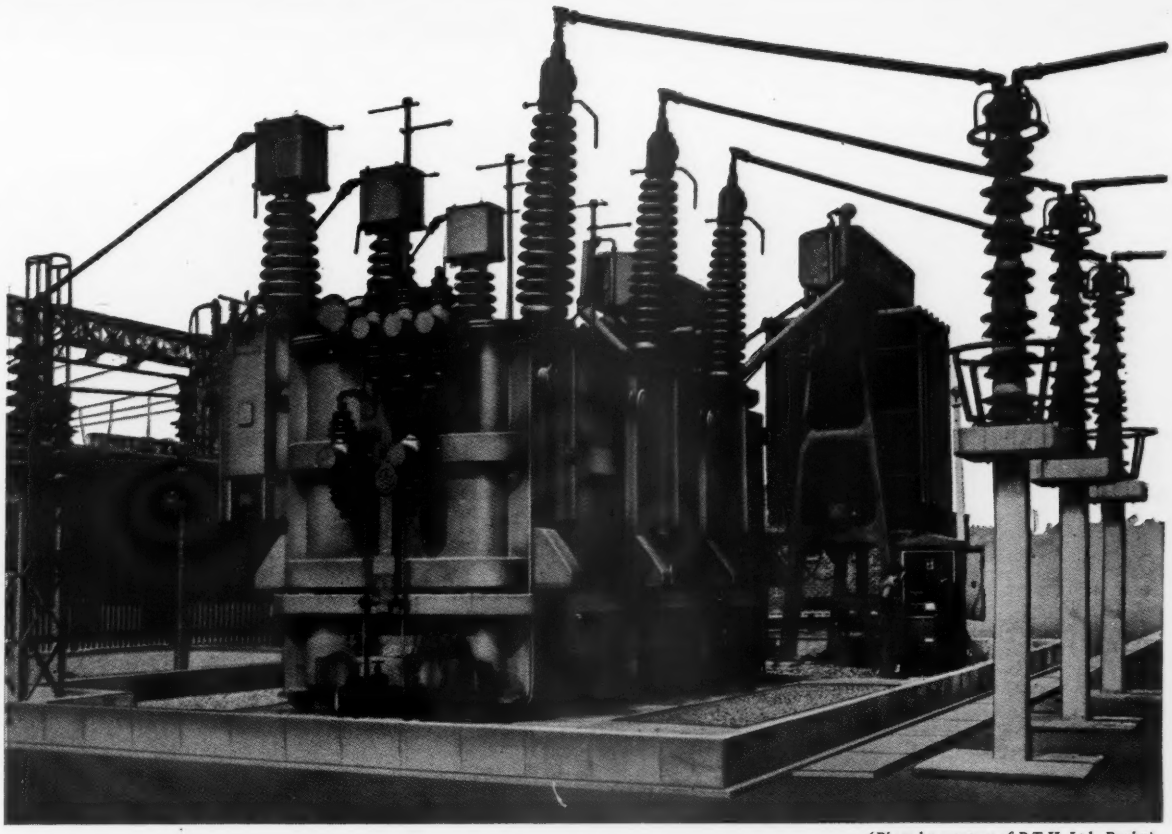

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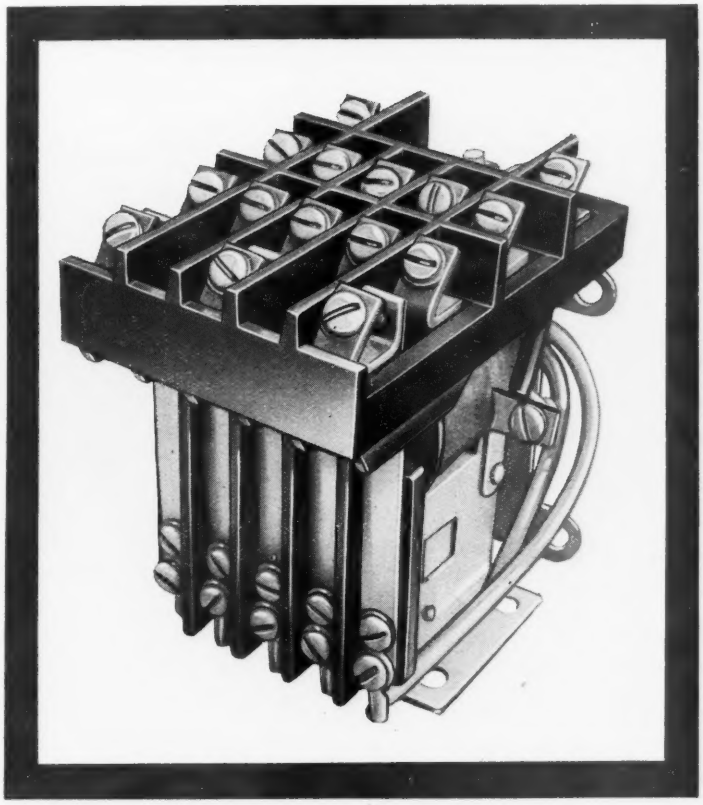

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5 - Blades,
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Suitable for frequent duty, this general purpose relay has passed a life test of 5 million operations at a rate of 150 operations per minute.

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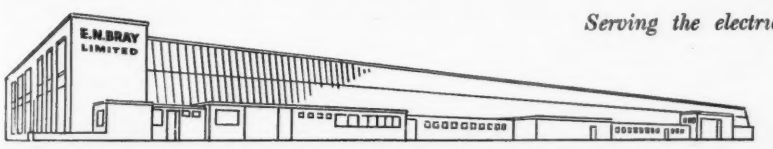
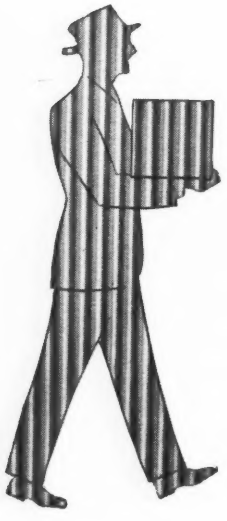


A case for everything and everything in its case ...



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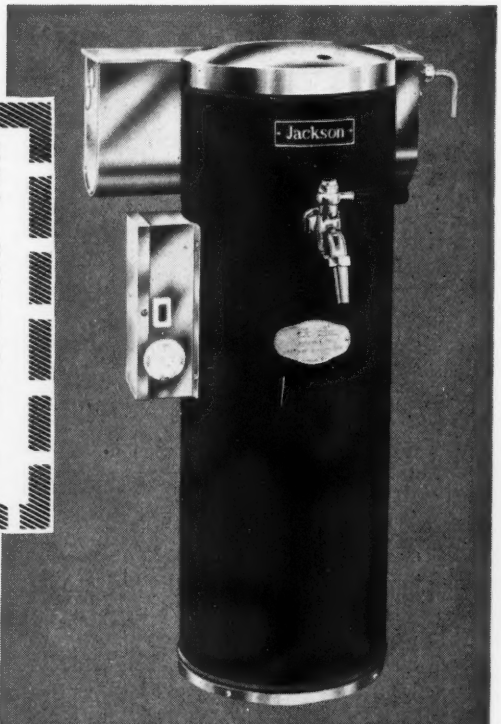
An automatically controlled boiler delivering positively boiling water within 5 minutes from switching on the current. The average delivery rate per minute under normal working conditions is three pints.

Standard equipment includes feed cistern; 3.5 kW. immersion heater; complete system of automatic control consisting of contactor, thermostat, master switch working in conjunction with boiling water draw off tap, metalclad fusebox and ironclad main switch.

The PM. model is available in burnished copper or chromium plated finish.



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A hand controlled electrically heated machine designed as an alternative to the automatically controlled Junior Model.

Under normal conditions the time for delivery of the *first* boiling water is approximately 8 minutes from switching to 'High'. After fully heating, boiling water can then be obtained very quickly each time the current is turned 'full on'. The average delivery rate under normal working conditions is $2\frac{1}{2}$ pints per minute. As the total loading of the boiler is only 3 kW. it can be connected to a standard plug. A new feature is the built-in control panel incorporating a 3-heat control switch and pilot light.

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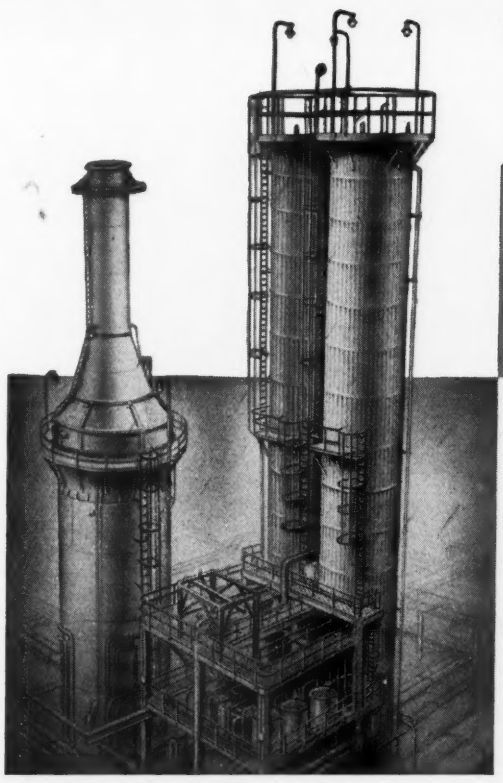

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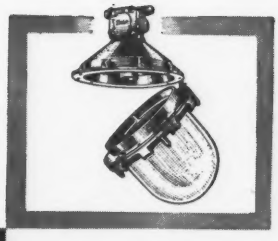

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Our district engineers in your area would gladly welcome an opportunity to fully explain and discuss the system, and at the same time submit samples for your inspection. Please ask for Weatherproof / Flameproof catalogue L 600 or non-flameproof catalogue L 700.

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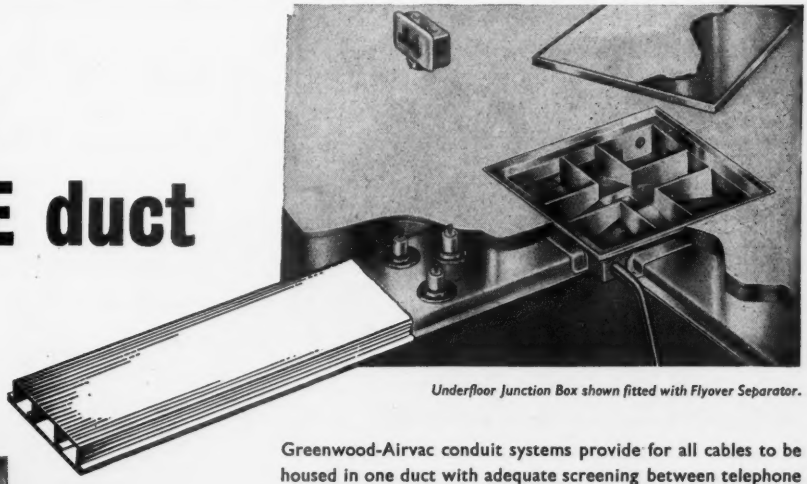
All cables in ONE duct



Underfloor Junction Box shown fitted with Flyover Separator.

Engineering & Research Building, Messrs. Ferguson Pailin Ltd., Manchester. Another Greenwood-Airvac Conduit underfloor installation.

Architects' Department Metropolitan-Vickers Electrical Co. Ltd. General Contractor:— Messrs. Pochin's Ltd. Electrical Contractor:— Messrs. W. J. Furse & Co. (Manchester) Ltd.

Greenwood-Airvac conduit systems provide for all cables to be housed in one duct with adequate screening between telephone and power cables. The unique construction of the underfloor system enables it to be laid where necessary in only 1½" of screed, and for applications where underfloor fitting is impracticable, a skirting system is readily available. Please write or telephone for the publication 'Greenwood-Airvac Conduit Systems' or call to see the demonstration layout in the Beacon House showroom.

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Greenwood-Airvac *conduit systems*

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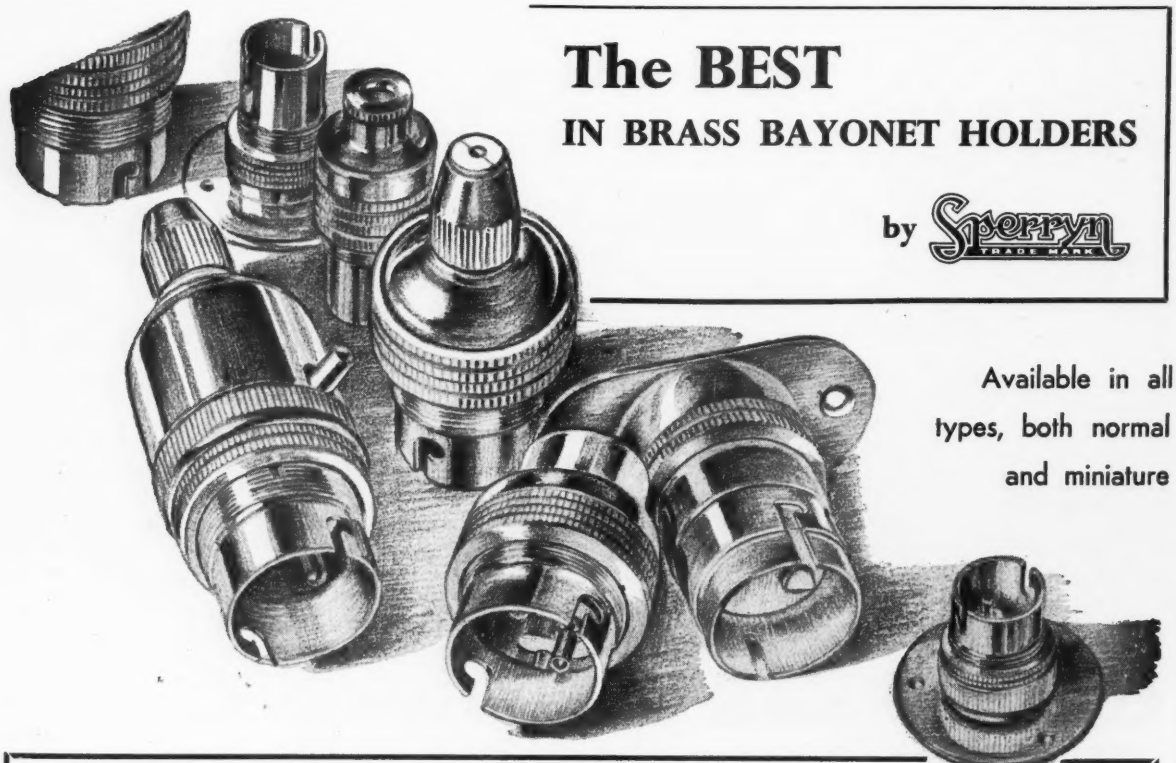

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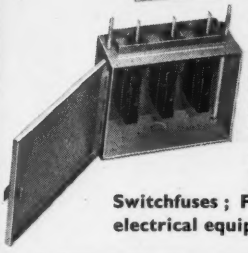

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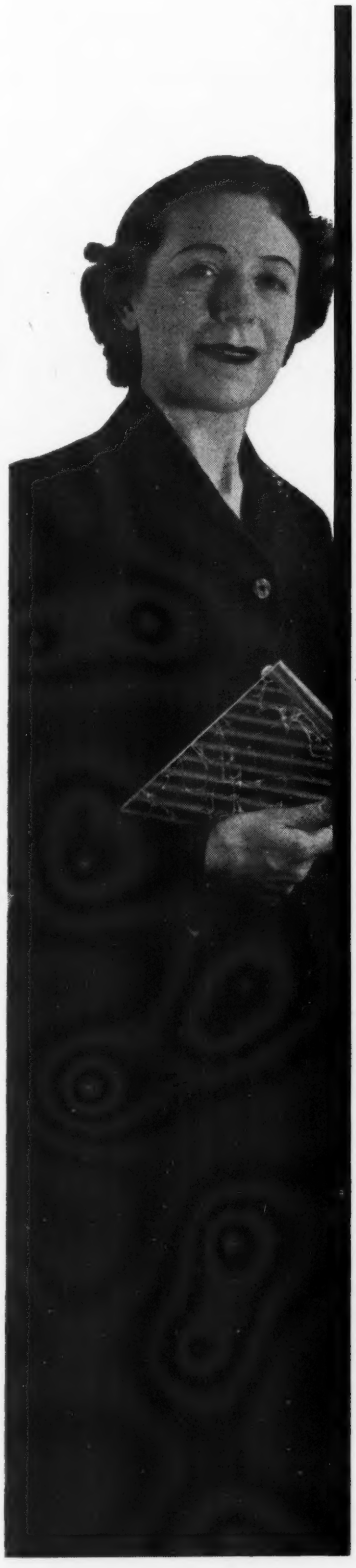

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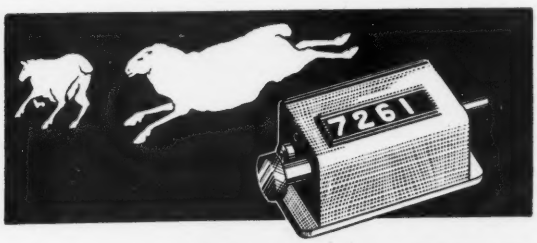

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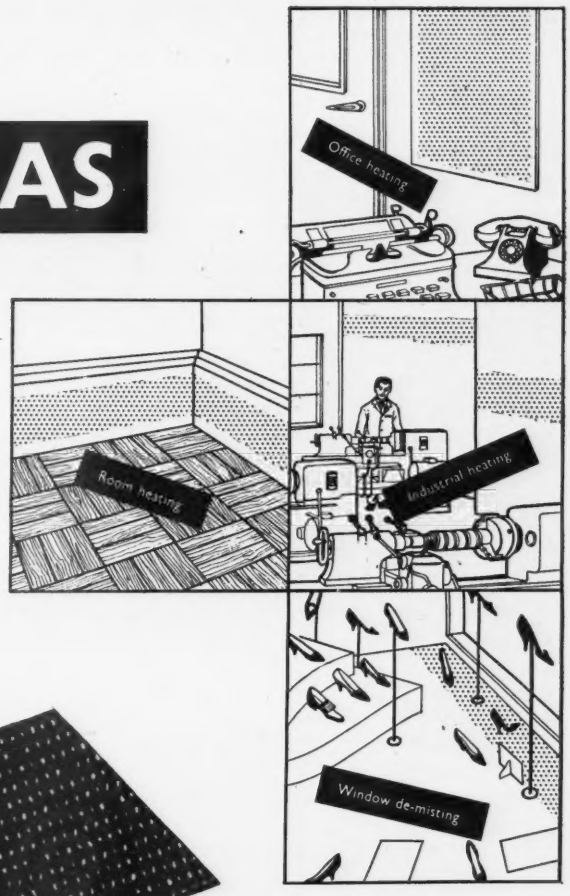

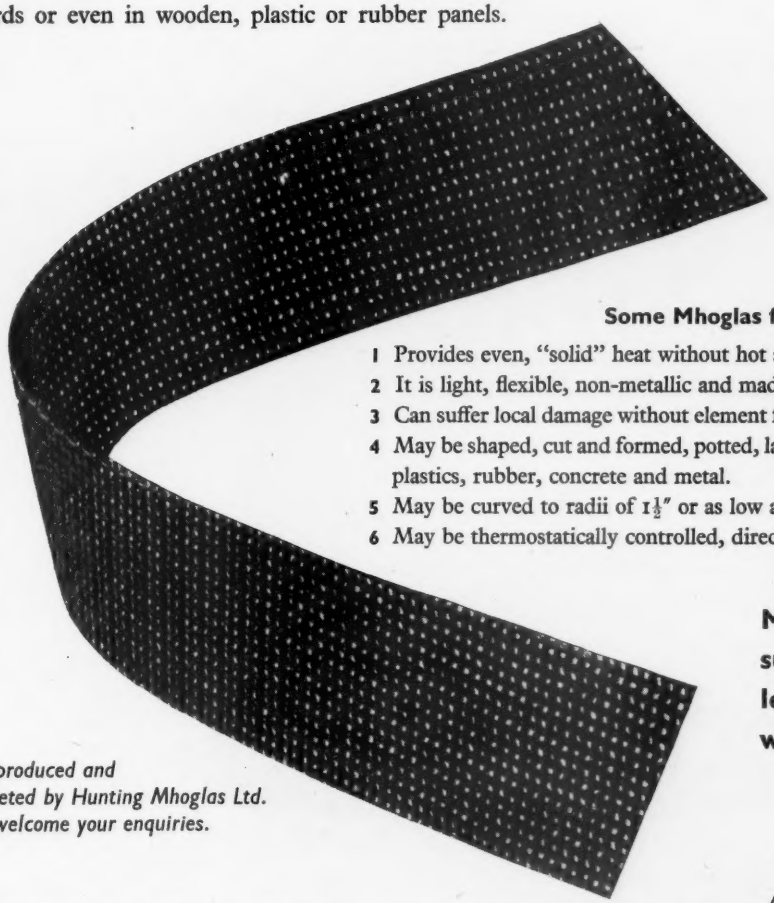

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6 May be thermostatically controlled, directly or remotely.

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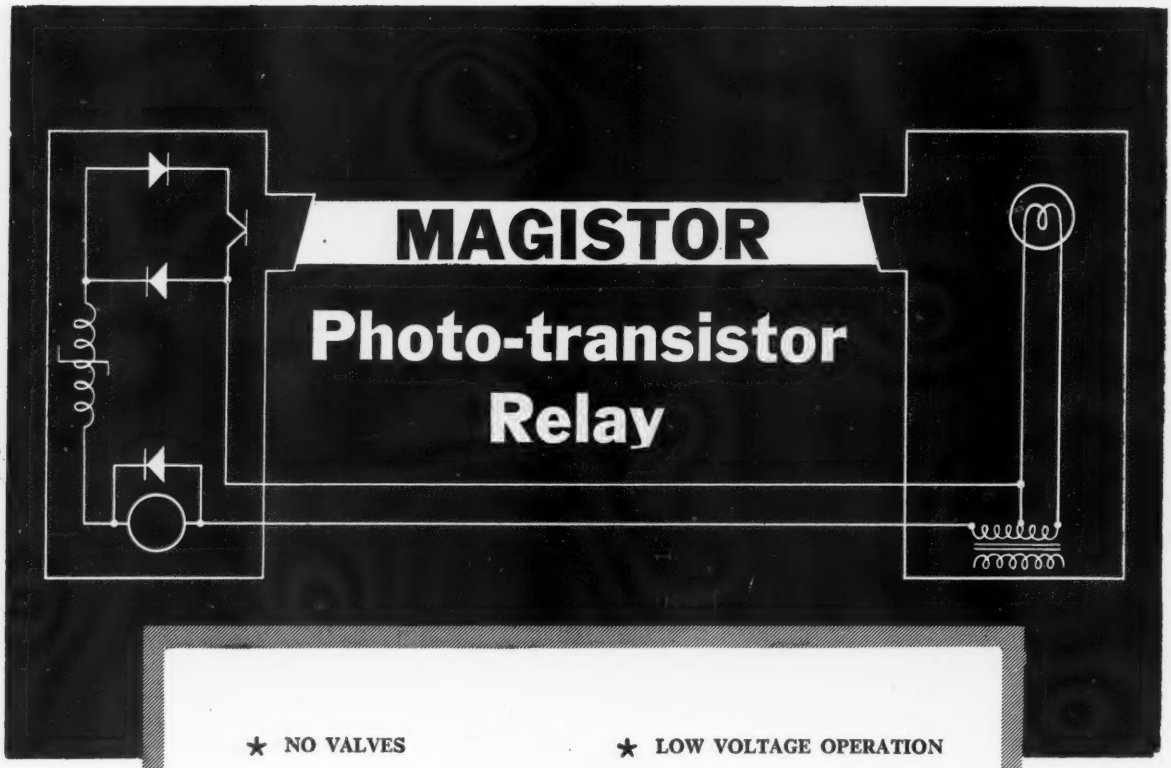

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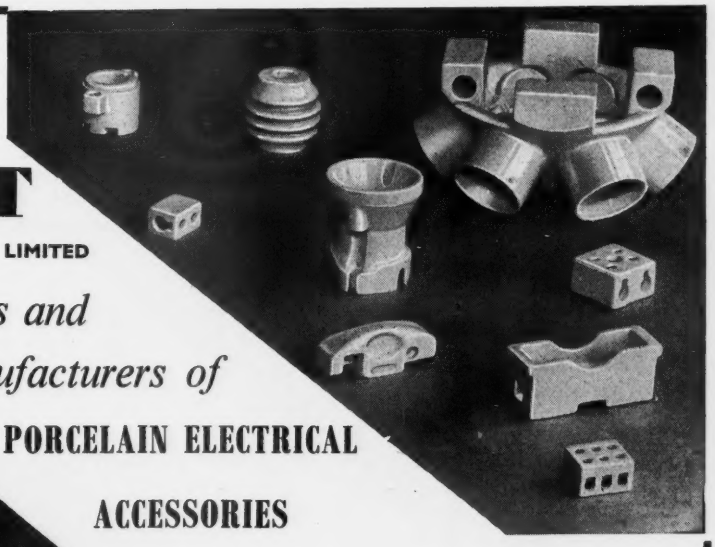

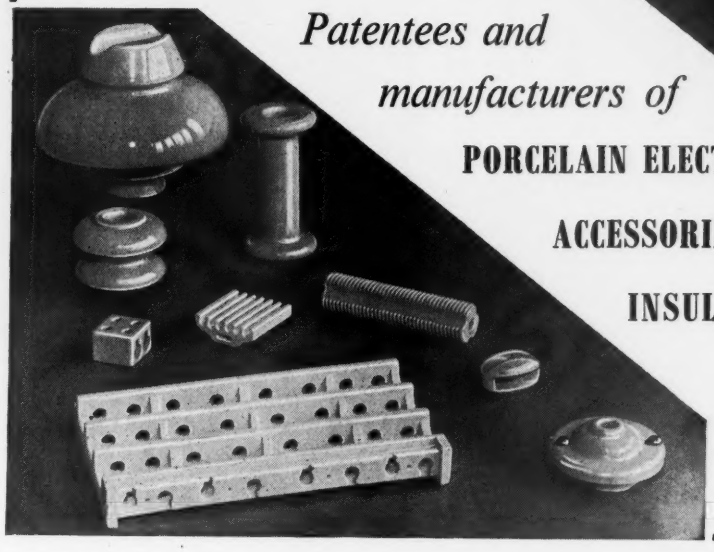

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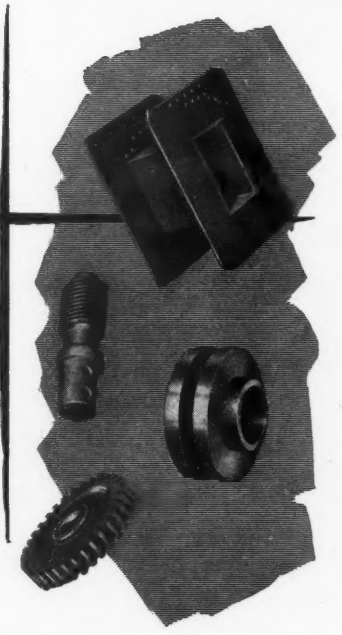

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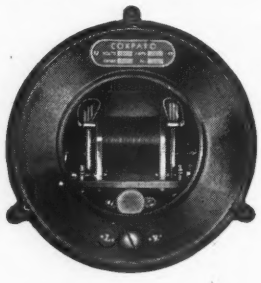

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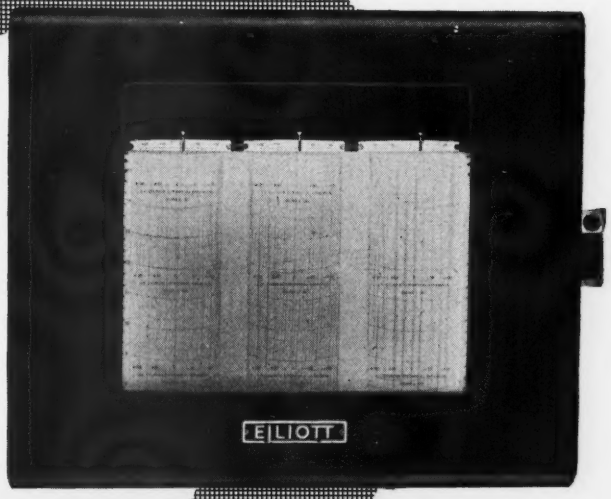

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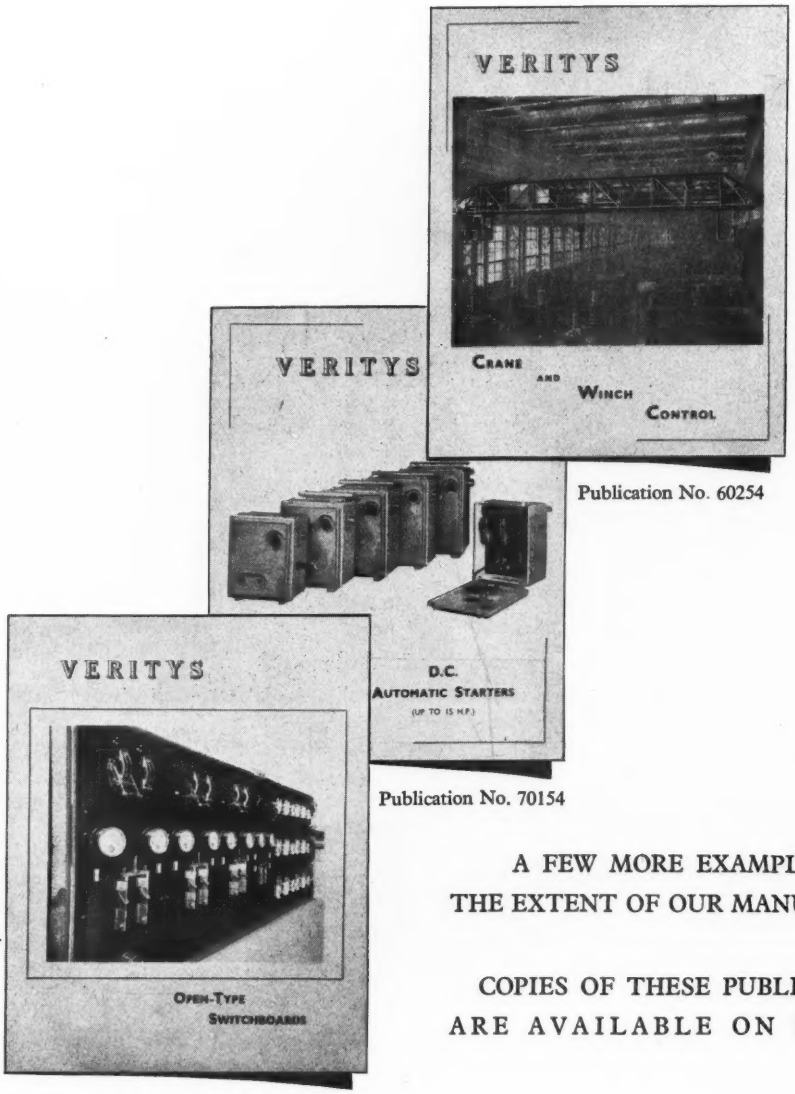

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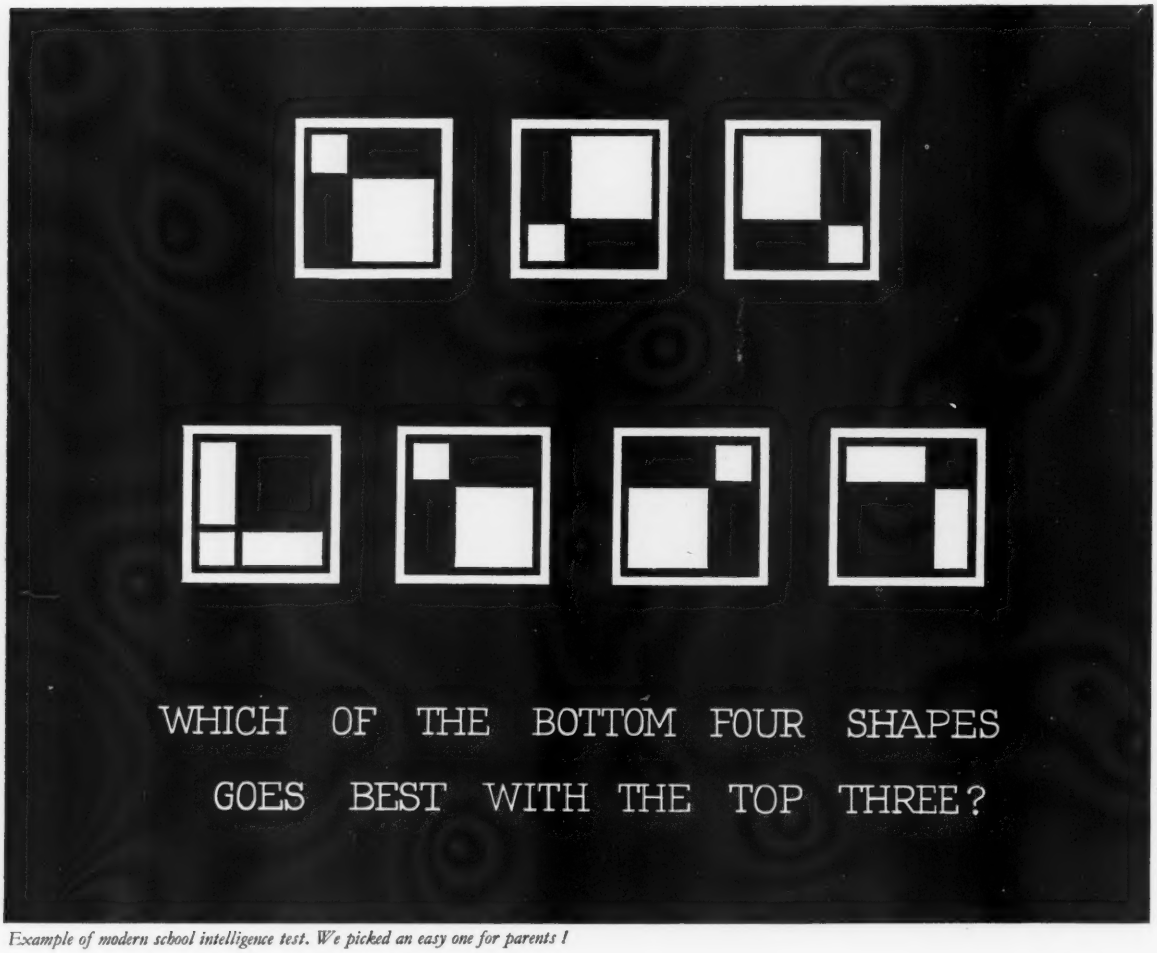

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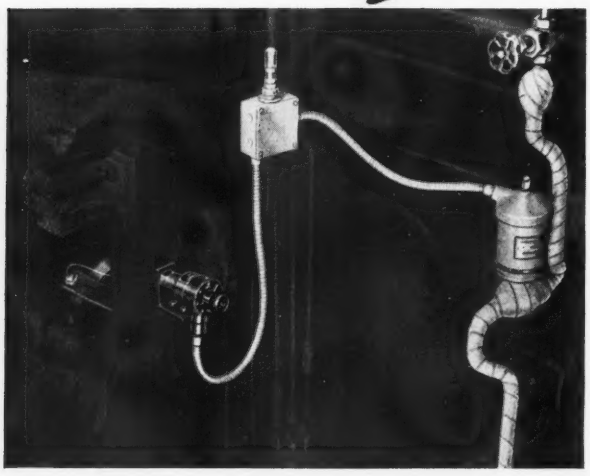

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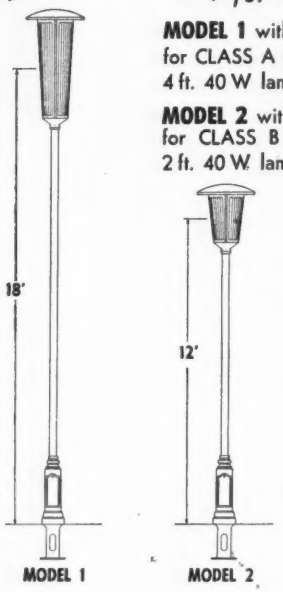

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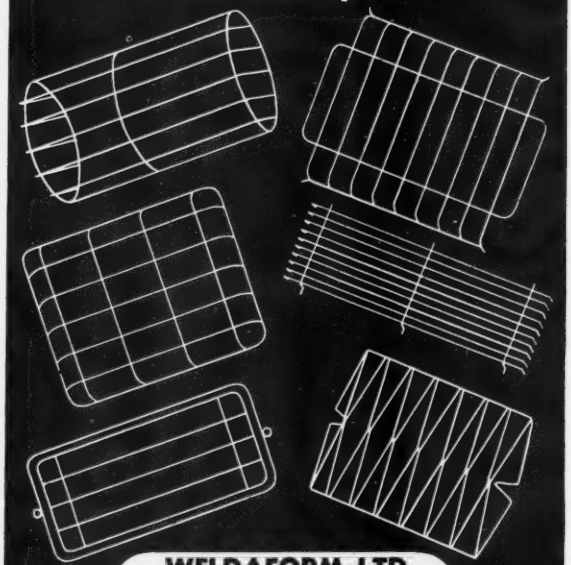

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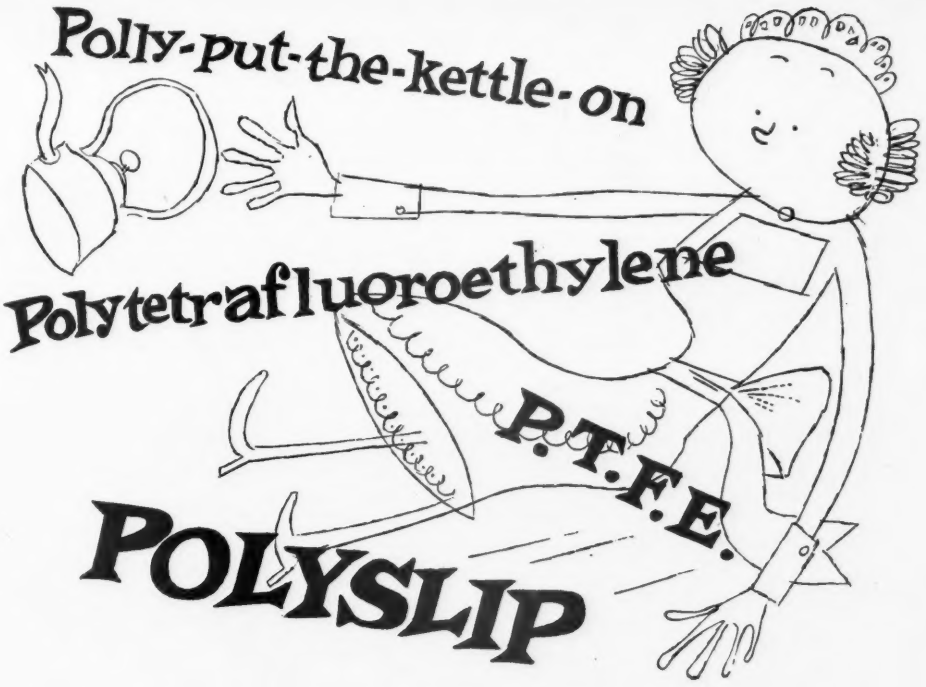

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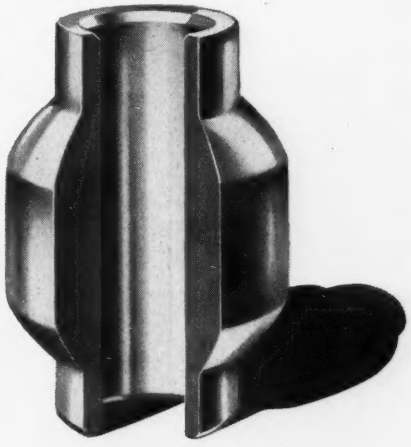

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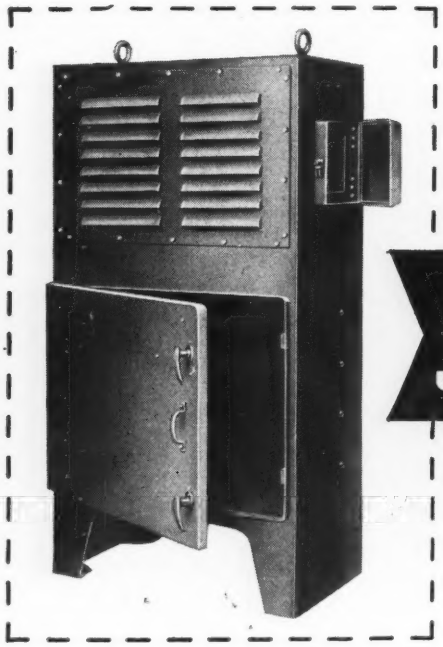

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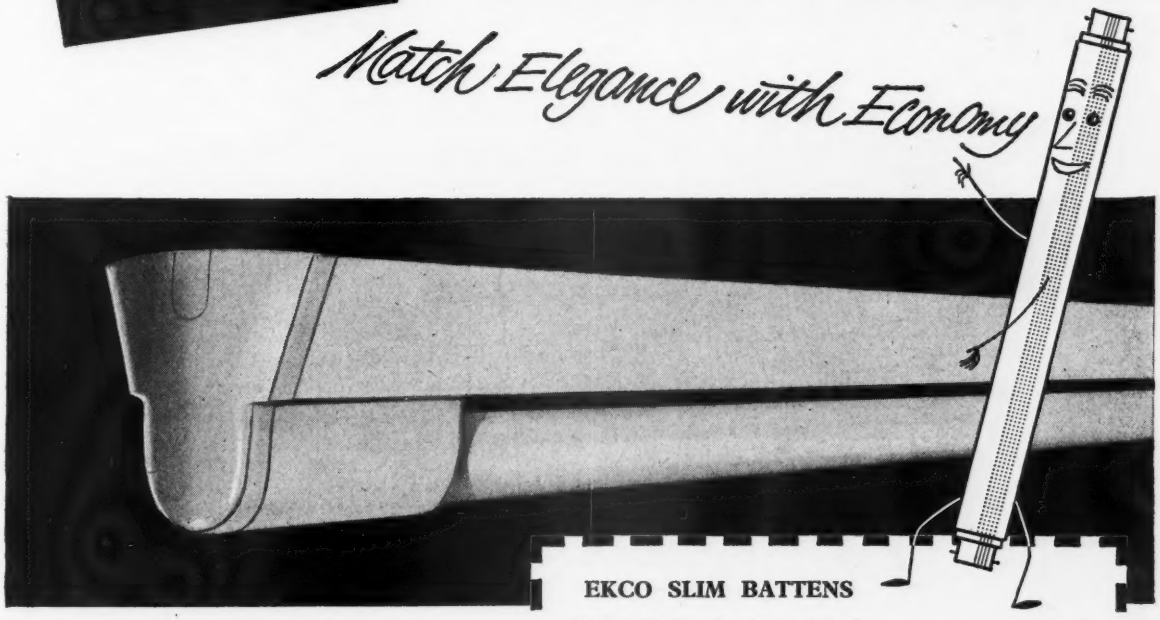

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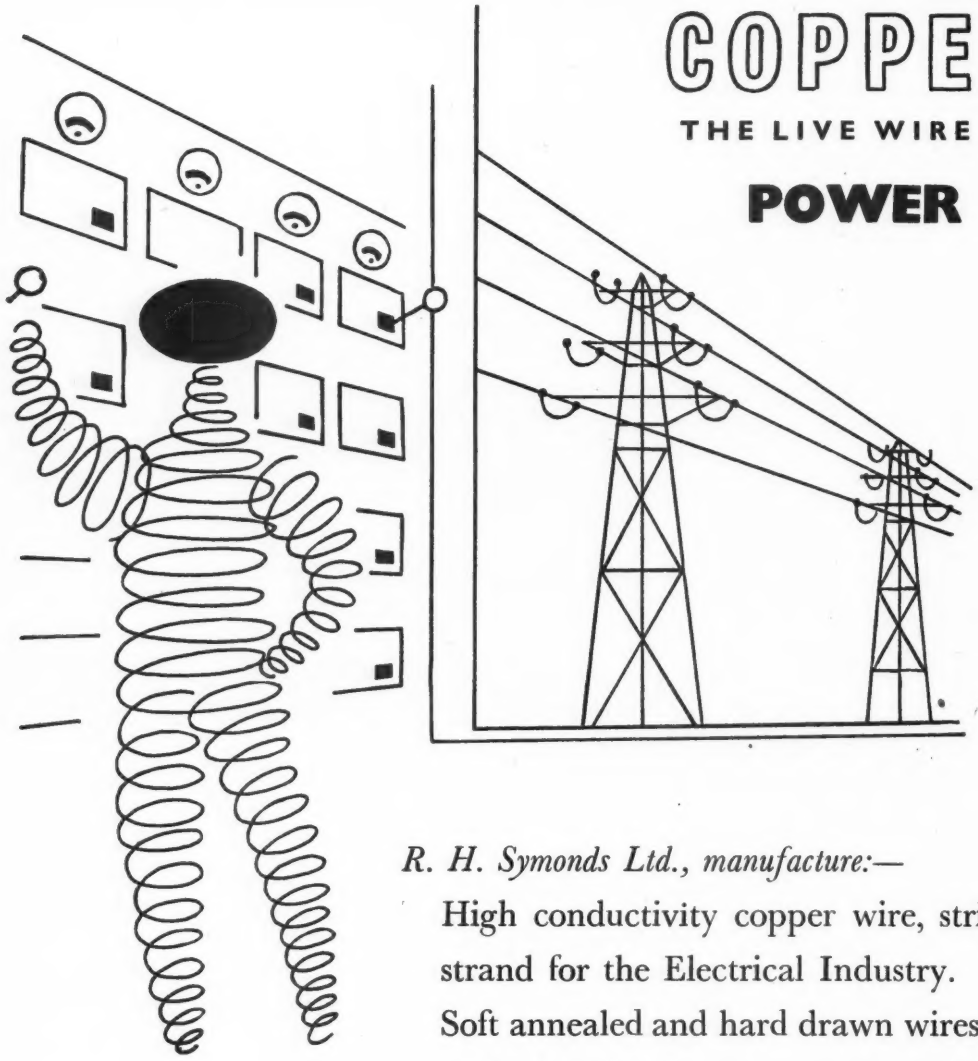

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MECHANICAL & MATERIAL HANDLING EQUIPMENT
SPACE HEATING EQUIPMENT . OIL FIRING
MEASURING & ELECTRONIC INSTRUMENTS
OFFICE MACHINERY & METHODS
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Complimentary Admission Tickets may be obtained Gratis upon application to the Organisers—

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DEAnsgate 6363 (4 lines)

Amalgam RESINACT—
A supremely efficient solder

Write to us for a sample of this A.I.D. approved, activated solder wire with non-corrosive RESINACT core. It is specially designed for all electrical work and is available to any specification in sizes from 4-22 W.G.
We are specialists in all forms of fusible alloys.

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ESTABLISHED 1833
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Telephone: HOP 0414 Telegrams: Amalgam, Sedist, London
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Insuloid cradleclip

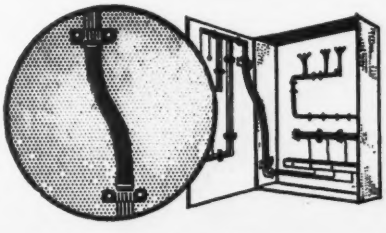
the revolutionary new wiring system

Combines high speed fixing with simplicity · Makes wiring systems neater and more compact · Completely insulated and suitable for all climates · Simplifies wiring adjustments · Assured electrical and mechanical security in all conditions · Substantially reduces wiring costs.

1, 2 . . and it's fixed!

Two simple movements and Cradleclip is truly fixed, quickly, efficiently and neatly! The Insuloid Cradleclip system is rapidly becoming standardised by more and more Companies of international standing. Cradleclip whilst being extremely simple in operation, sacrifices no point of technical efficiency and is suitable for service in all climatic conditions with a temperature range of −60° C to +100° C. Cradleclip is another Insuloid contribution to progress in the electrical industry. We would be pleased to send you fully descriptive literature telling you all about the Cradleclip revolutionary wiring system on request.

and Flexiguard cable trunking



Developed by Insuloid for cubicle-to-door wiring protection and speed of installation. Simple to fix and an obvious aid to wiring problems. Literature available now.

Insuloid Ringlock Bush

A snap action, quick locking bush that will not come out after fixing. Simple finger action, instantaneous assembly for complete security in service.

NX, X & CY Clips

The well known Insuloid range of cable clips in nylon and P.V.C. For long service, anti-corrosive, non-chafing and very economical.

Insuloid products for greater cable fixing efficiency

INSULOID MANUFACTURING CO. LTD.

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Tel: WYT 2842 & 3163. Grams: INSULOID MANCHESTER

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Stock up now with the new "Dryad" Hair Dryer. Light in weight, extremely robust and dependable, the "Dryad" Hair Dryer is a worthy addition to the list of Bylock best-sellers. Automatic element cut-out—fully suppressed.

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Serial No. 2461 BRITISH GOOD HOUSEKEEPING INSTITUTE GUARANTEES REFUND OR MONEY OF REPLACEMENT IF NOT IN CONFORMITY WITH THE INSTITUTE'S STANDARDS

All Bylock electrical products are custom-built and backed by powerful and continuous publicity. Write for attractive trade terms and literature.

BYLOCK ELECTRIC LTD

ENFIELD · MIDDLESEX

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VIR TB&C
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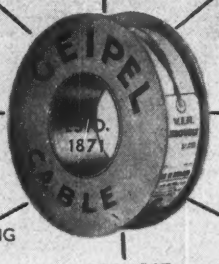
BSS 638 WELDING

BSS 883 SHIP WIRING



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BSS 1557
POLYTHENE/PVC
"VULCATHENE"

THERMOPLASTIC

MADE AND TESTED TO BRITISH STANDARD SPECIFICATIONS

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Vincent

CHANGE-OVER SWITCHES
30-800 AMPS 2-3-4-POLE

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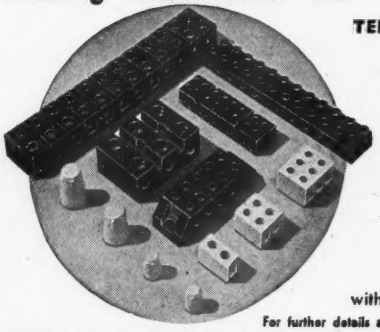
Vincent Works, Sampson Road North, Birmingham 11
Telephone: VICtoria 2853 *Telegrams:* "ABBOGEAR BIRMINGHAM"

Making Connections the "METWAY"



TERMINAL BLOCKS AND CONNECTORS

- **MOULDED**
  5-40 Amp.
  1-12 Way
- **FLEXIBLE NYLON**
  5-30 Amp.
  1-12 Way
- **PORCELAIN**
  5-60 Amp.
  1, 2, 3 way, with or without centre fixing hole

For further details ask for Cat. No. OHN/32/ER

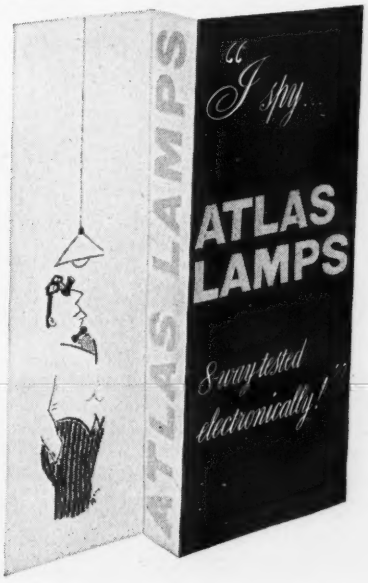
METWAY WORKS, KEMP TOWN, BRIGHTON

"I spy..."

ATLAS LAMPS

8-way tested— electronically!"

Large-scale advertising in the National Press, on all commercial TV stations and on Posters throughout the country is telling everyone the impressive Atlas story . . . Atlas lamps are 8 way tested, electronically. Electronic testing ensures that both you and your customers get only perfect lamps. More and more people will insist on Atlas lamps. So be wise, stock and display Atlas lamps—using the free display material that is available.



FREE DISPLAYS

similar to this example tie up with National Press and T.V. advertising in your shop. Full details from your wholesaler or Atlas Representative.

ATLAS LIGHTING LIMITED
A subsidiary company of Thorn Electrical Industries Ltd., 233 Shaftesbury Ave., London W.C.2

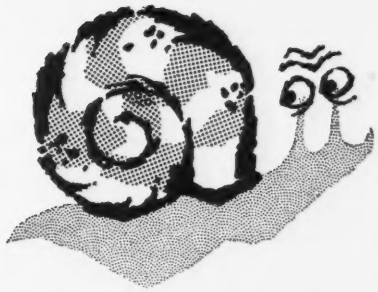
Universal Rotor treating lathe, type WBD-V

We have manufactured for many years
machines for every
electrical workshop need and will gladly place our experience at your disposal.

MICAFIL

ELECTRICAL INSULATION CONDENSER BUSHINGS NEPOLIN CAPACITORS
HIGH-VOLTAGE TESTING EQUIPMENT COIL WINDING MACHINES VACUUM PUMPS

MICAFIL LTD. ZURICH SWITZERLAND



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A big load . . . at a snail's pace?
Or a small load . . . fast?
Whatever the application
let Renold take the weight off your mind.
With an unequalled range of conveying chains and attachments,
Renold Chains can meet all your requirements
and carry your handling problems to a logical conclusion.

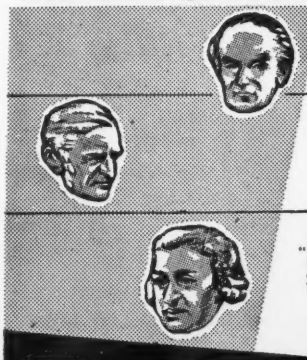
RENOLD

CHAINS FOR MECHANICAL HANDLING

RENOLD — *the FIRST name in precision chain*

RENOLD CHAINS LIMITED • MANCHESTER

Famous Quotations



ON LAND
"When tillage begins, other arts follow. The farmers, therefore, are the founders of human civilisation."
Daniel WEBSTER (1782-1852)

SEA
"The most advanced nations are always those who navigate the most."
Ralph Waldo EMERSON (1803-1882)

& AIR
"Soon shall thy arm, unconquered steam, afar
Drag the slow barge, or drive the rapid car;
Or on wide waving wings expanded bear
The flying chariot through the field of air."
Erasmus DARWIN (1731-1802)

BUT

FOR THE BEST ALUMINIUM & NON-FERROUS CASTINGS ON EARTH

LET SANDWELL QUOTE

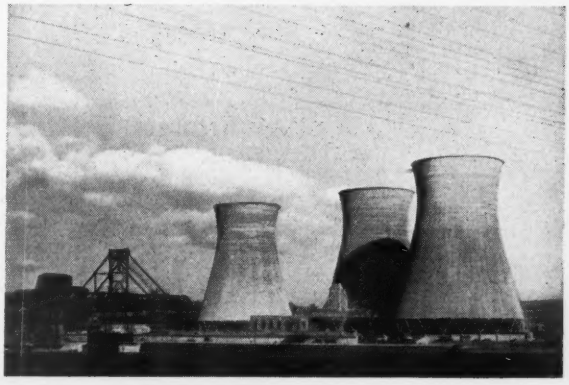
SCC

Specialists in the production of the finest quality Sand Castings, Gravity Die Castings and Pressure Die Castings in all Light Alloys and Non-Ferrous Metals by the most modern methods.

Makers of the famous 'SOUNDWELL' Factory Fire Alarm Bell. Illustrated literature on request.

THE SANDWELL CASTING CO.
BANK STREET FOUNDRY, WEST BROMWICH
Tel: STOnecross 2231 (4 lines) Grams: "REPCAST" West Bromwich
One of the SANBRA Group of Companies

DAVENPORT



THE PHOTOGRAPH ILLUSTRATES JUST ANOTHER

WATER COOLING

INSTALLATION BY

THE DAVENPORT ENG. CO. LTD.
BRADFORD

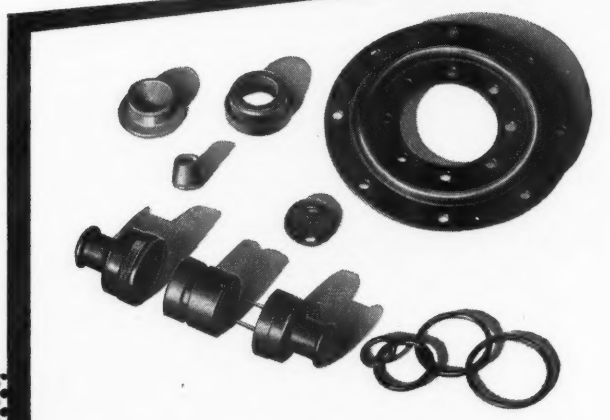
PR

Rubber Components for the more Exacting Applications

Our wide experience in the field of precision rubber engineering qualifies us to advise on the rubber compounds and design of components to meet the more exacting applications. Our plant is fully equipped to deal with bulk production as well as small quantity requirements for prototype and development work.

Designers and Engineers will be interested in our new publication, 'Synthetic and Natural Rubbers and their Uses' — copy sent upon request.

High Grade Rubber Mouldings and Extrusions · 'O' Rings Seals · Bushes · Grommets · Diaphragms · Bonded Parts and Components in Natural, Synthetic and Silicone Rubbers



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PRECISION RUBBERS LIMITED · BAGWORTH · LEICESTER · Phone: BAGWORTH 241/2/3

Producers of Rubber Mouldings to fine dimensional tolerances and officially approved specifications

resistance wire and tape

of highest grade in

NICKEL CHROMIUM
NICKEL CHROMIUM IRON
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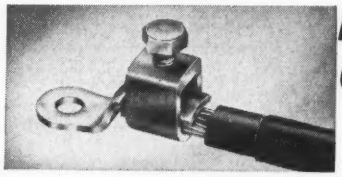
also

PURE NICKEL
STAINLESS STEEL
AND TITANIUM WIRE

AW

ALLOY WIRE CO. LTD.
Lawrence Lane · Old Hill
Staffordshire
Telephone: Cradley Heath 6575



ELECTRICAL CONNECTORS

TEE, STRAIGHT AND TERMINAL TYPES FOR ALL CONDUCTORS

Light weight type: In three sizes to take from 7/64" to 1/2" diameter conductors. Lighter weight types also available.

BRITISH SWITCHGEAR CORPORATION Ltd.
MAKERS OF H.T. SWITCHGEAR
Morden Factory Estate, London, S.W.19
Lib. 2273-5

have you a **SWITCHING** *problem?*

then consult us for all types of

MERCURY SWITCHES

We offer completely reliable Switches coupled with good delivery

Write for catalogue

QUICKSILVER TUBE MNFG. CO.
WILLOW ROAD COLNBROOK, BUCKS. Tel. Colnbrook 382

The effects of interference on radio and television is a much debated topic among manufacturers, authorities and public alike.

The rapid increase in possible sources of interference, in the form of new domestic and industrial appliances, serves only to intensify the problem.

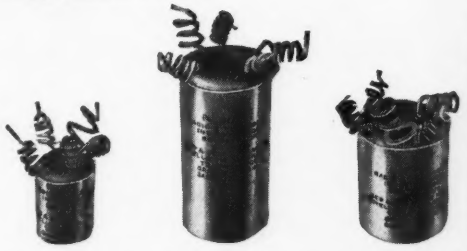
For the effective control of interference...

Commutator motors, discharge lighting, thermostat operation and electro-medical equipment are the prime offenders. The best way to tackle the job of suppression is to build-in the necessary components at the equipment manufacturing stage. Wisely, most manufacturers rely on Plessey Suppressors, of which there are four main types giving a comprehensive coverage for the majority of requirements.

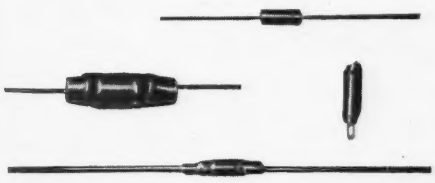
Manufacturers and Design Engineers are invited to write for Plessey Publication No. 952 which contains full details.

4 Suppressor ranges by Plessey

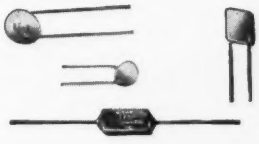
Standard Composite Interference Suppression Filters



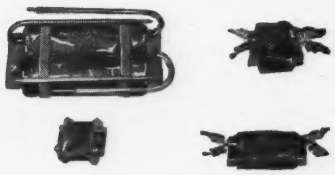
Television Interference Suppression Inductors



Capacitors for Radio and Television Interference Suppression



Radio Interference Suppression Inductors

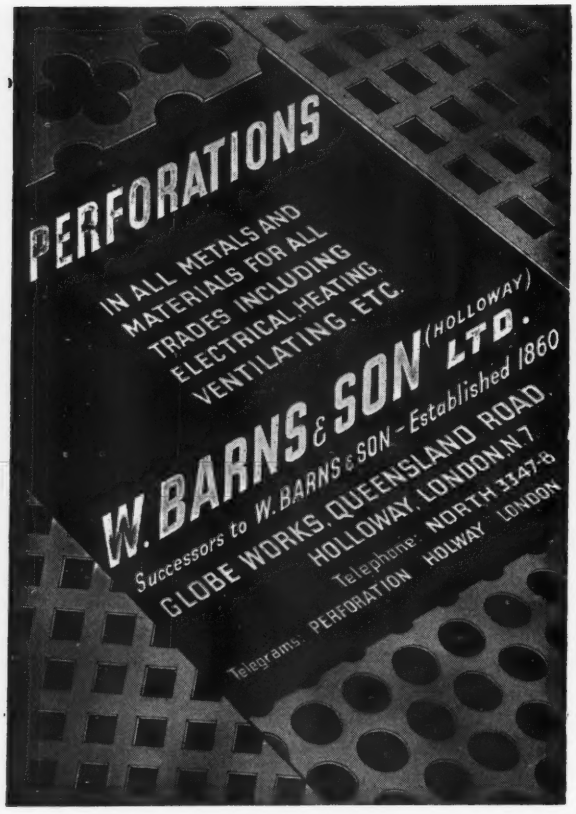


COMPONENTS GROUP • CHEMICAL AND METALLURGICAL DIVISION

THE PLESSEY COMPANY LIMITED • WOOD BURCOTE WAY • TOWCESTER • NORTHANTS • TEL: TOWCESTER 312

Overseas Sales Organisation: PLESSEY INTERNATIONAL LIMITED · ILFORD · ESSEX · ENGLAND · TELEPHONE: ILFORD 3040

T.C.3


PERFORATIONS
IN ALL METALS AND MATERIALS FOR ALL TRADES INCLUDING ELECTRICAL HEATING, VENTILATING, ETC.
W. BARNS & SON (HOLLOWAY) LTD.
Successors to W. BARNS & SON - Established 1860
GLOBE WORKS, QUEENSLAND ROAD, HOLLOWAY, LONDON, N.7
Telephone: NORTH 3347-8
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RESISTANCE WIRES

TOPHET

STAINLESS STEEL WIRES

The 'Tophet' range of resistance materials is eminently suitable for use under the most exacting conditions as the physical and mechanical properties always remain constant, ensuring long and efficient service.

Our RESISTANCE HANDBOOK gives complete electrical and physical data regarding 'Tophet' resistance wires, stainless steels and ultra fine wire, as well as particulars of our 'Truflex' thermostatic bimetal.

Manufactured by **GILBY-BRUNTON LIMITED**
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Telephone: Musselburgh 2369
LONDON OFFICE: 47 WHITEHALL, S.W.1. *Tel: WHitehall 6058*

Thermalair

HEATING and VENTILATING EQUIPMENTS

The NEW "Bournemouth"

CONVECTOR
with Energy Regulation

A beautifully finished contemporary heater in pastel colours or wood finishes to blend with all types of decorations, incorporating an energy regulator giving tap selection of heat output from zero to maximum with off position. The element is designed for low temperature giving long and trouble free life. The interior has been specially designed to give the maximum output with minimum surface temperatures. Easily accessible for service. Complete with lamp.

PRICES ON APPLICATION

SPECIFICATION

CASE	Good quality wood with heavy gauge steel case.
ELEMENT	Long life spiral wound nickel chrome black heat.
REGULATOR	Mechanically robust, suitable zero/15 amps. Silent in operation.
VOLTAGES	200/220, 230/240, 250, A.C. Or D.C. without regulator.
LOADINGS	1kw. 2kw. 3kw.

H.V.E. (ELECTRIC) LTD.
Viaduct Works, Kirkstall Rd., Leeds 4
Phone: Leeds 29315 (3 lines)

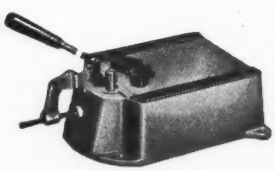
HYDE FOOT-OPERATED WIRE STRIPPER

Strips a wide range of insulated wires and small flexible cables up to ¼" outside diameter. Operating in one quick, effortless action, the stripper will not nick or damage wires.

HYDE E-Z WIRE STRIPPER

Used by hundreds of manufacturers, contractors and service agents, Precision stripping with the E-Z saves wasting wire, prevents nicking and protects the user's fingers.

Stripping without teasing



HYDE BENCH-TYPE CABLE STRIPPER

Strips insulation from cables up to ⅝" outside diameter, no splaying, no nicking, and one single movement does the whole job quickly and cleanly.

The days of clumsy stripping with knife or pliers have gone — the efficient, modern method is to use HYDE wire and cable strippers. Adjustable stops control length of strip. For greater production and perfect results without skill or experience, HYDE strippers are essential.

Obtainable from all good Tool Dealers or directly from the makers:

J. B. HYDE & CO. LTD.
Altrincham Road
WYTHENSHAWE, MANCHESTER.
Telephone: WYThenshawe 2850.
Telegrams: "Braiding, Wythenshawe"

The sign of the RIGHT time ....

The last seconds of the interval clock tick away.... another programme starts.... strictly on time.

The skilful planning of B.B.C. Television Programmes depends upon perfect co-ordination throughout the organisation—co-ordination only made possible by accurate, precise timing.

Exactly the same perfect co-ordination is possible in any Industrial or Commercial Establishment from the same precise equipment if you do as the B.B.C. do (and so many thousand others throughout the world) install...

GENTS' OF LEICESTER ***CONTROLLED*** **ELECTRIC CLOCK SYSTEM**

Write for our free booklet "Gents' Controlled Electric Clock System"

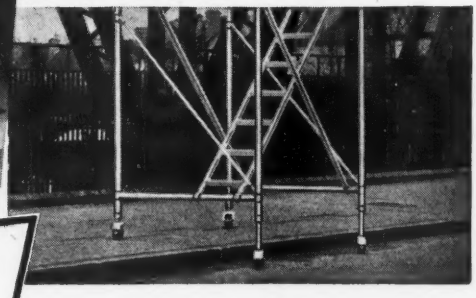
GENT & COMPANY LIMITED · FARADAY WORKS · LEICESTER

London Office & Showrooms: 47 Victoria Street, London, S.W.1.

ALSO AT: BELFAST · BIRMINGHAM · BRISTOL · EDINBURGH · GLASGOW · NEWCASTLE

Other Products include: Fire Alarm Systems · Watchman's Clocks · Bell & Indicator Systems · Time Recorders · Staff Location Systems, Etc.

20ft. high in 90 seconds!



Zip-Up STAGING

TRADE MARK

That's typical of the speed of erection of ZIP-UP Staging. Let us show you how it's done—with no skill, no loose fittings, no tools. Reaches any working height up to 65 ft. in record time. (Note how the legs are adjustable to stand on uneven surfaces). Write for catalogue (C.15) giving full description and ask for a demonstration.

ACCESS EQUIPMENT LIMITED

Maylands Avenue, Hemel Hempstead, Herts, England. Telephone: Boxmoor 5781. Cables: Accesequip, Hemel Hempstead.

NOW AVAILABLE

CHROMIUM PLATED

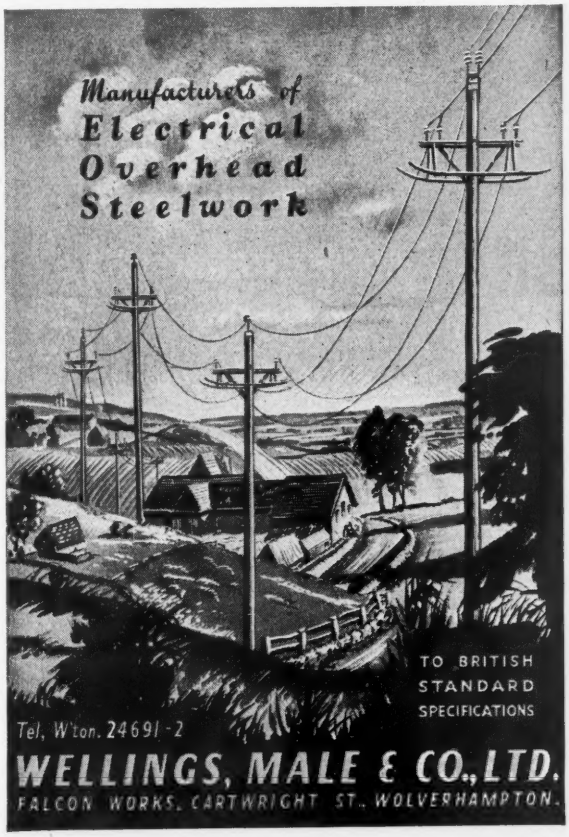
Steel Strip in Coils

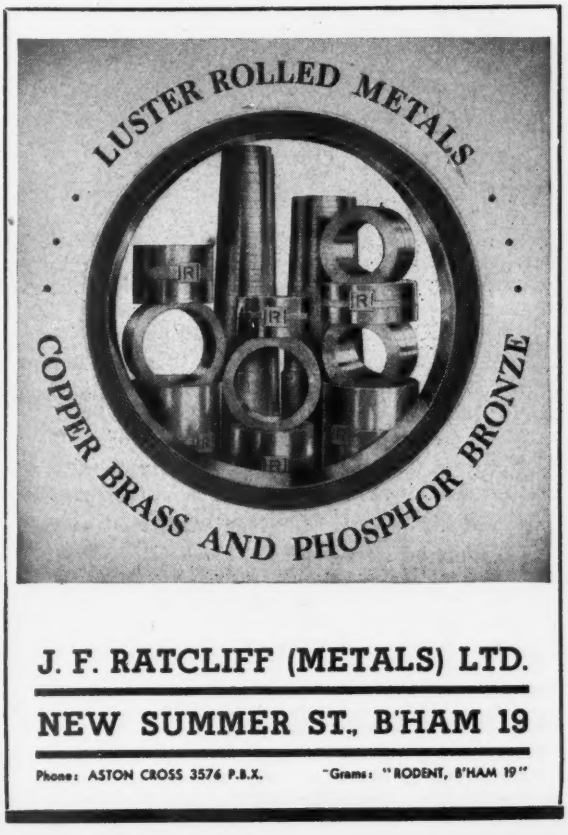
We are pleased to announce that in addition to our well known "PRESBRITE" Nickel Plated Steel and Tinned Steel, we can supply Chromium Plated Steel in coils. Widths from ½" to 15¾ wide. Gauges from 35 s.w.g. to 18 s.w.g.

Willmott Taylor
LIMITED

Wharfdale Road, Tyseley, Birmingham. Telephone: ACO. 1186

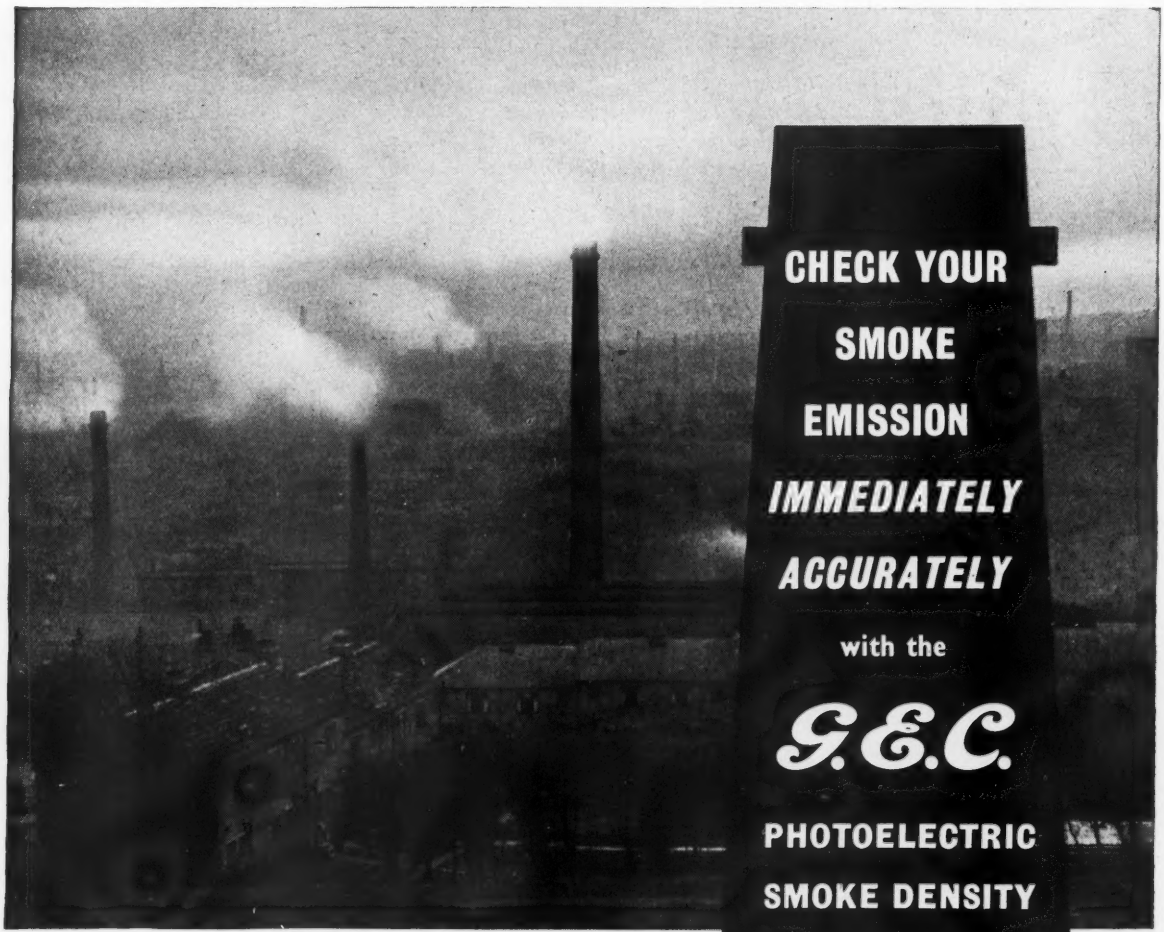
L.G.B.




LUSTER ROLLED METALS
COPPER BRASS AND PHOSPHOR BRONZE
J. F. RATCLIFF (METALS) LTD.
NEW SUMMER ST., B'HAM 19
Phone: ASTON CROSS 3576 P.B.X.
"Grams: "RODENT, B'HAM 19"

SMOKE

A MATTER OF URGENCY FOR EVERYONE

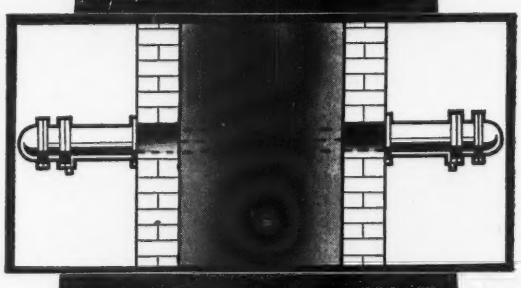


CHECK YOUR SMOKE EMISSION *IMMEDIATELY ACCURATELY* with the G.E.C. PHOTOELECTRIC SMOKE DENSITY MONITOR

The G.E.C. Photoelectric Smoke Density Monitor has been designed, in the interest of smoke abatement, to monitor the density of smoke in a stack. A light beam is projected across the stack. Visual and audible alarm systems operate whenever the density exceeds a pre-set level, the event being recorded. The circuit is designed so that, wherever possible, failures of components set the warning relay to the alarm position.

- *Constructed to comply with BS 2740/1956.*
- *Suitable for spans of 1 ft. to 10 ft.*
- *All enclosures are weatherproof and of cast construction.*
- *Stabilised power supply to projector and receiver.*
- *Projector intensity is electrically adjustable for varying operational conditions.*
- *Calibration by means of one simple adjustment.*
- *Provision for an air flow over the glass slides reduces deposits of soot thus minimising manual cleaning.*

For further details, please write for Publication OV 3865



THE GENERAL ELECTRIC CO LTD · MAGNET HOUSE · KINGSWAY · LONDON · WC2

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

DISPLAYED CLASSIFIED:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

ADVERTISEMENTS are accepted up to **First Post on Monday** of the week of issue and should be addressed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

ELECTRICITY (ESSENTIAL SUPPLIES) ACT (NORTHERN IRELAND) 1954

CITY AND COUNTY BOROUGH OF BELFAST

Electricity Department

TENDERS are invited for the supply, delivery and erection of :—

(a) 1,200-lb. Goods Electric Lift for Administration Building at First Extension of Belfast Municipal Electric Power Station West (Form of Tender N.2056).

(b) The Lighting, Heating and Electric Power Supply Installation for the Workshop and Administration Buildings, First and Second Extensions, Belfast Municipal Electric Power Station West (Form of Tender N.2081).

Forms of tender, conditions and specifications, in quintuplicate, may be obtained from Messrs. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle upon Tyne, 1, on payment of a deposit of five guineas in respect of each item (a) or (b). These deposits will be refunded provided bona fide tenders are lodged and not withdrawn. Extra copies of the tender documents may be obtained at one guinea each; this sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each tender, in quadruplicate, in sealed envelope, marked " Tender for ——, Electricity Department," and endorsed with the name and address of the tenderer, must be addressed to the Town Clerk, City Hall, Belfast, so as to reach him not later than 4 p.m. on Friday, 15th November, 1957.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

C. A. R. SHILLINGTON,
Chairman,
Northern Ireland Joint Electricity Committee.

Chichester House,
Chichester St., Belfast.
9th October, 1957. 942

COUNTY BOROUGH OF BARNSLEY

Lundwood Sewage Works Reconstruction

Machinery Contracts, etc.

Contract M : Electrical Installation

TENDERS are invited from competent Industrial Electrical Contractors for the installation of the various electrical services to the buildings and the sewage treatment machinery, together with an underground medium-voltage distribution system, throughout the works.

Tenderers may apply for schedules, specification and the form of tender to the Borough Engineer, Town Hall, Barnsley.

The Corporation do not bind themselves to accept the lowest or any tender and the acceptance of a tender will be subject to the approval of the Ministry of Housing and Local Government.

Tenders should be enclosed in the envelopes provided and delivered to the undersigned not later than 10 a.m. Friday, 22nd November, 1957.

A. E. GILFILLAN,
Town Clerk.

Town Hall,
Barnsley.
September, 1957. 792

URBAN DISTRICT COUNCIL OF ESTON

Public Lighting Improvements

TENDERS are invited for the supply and delivery of Lighting Columns and Brackets as set out below :—

9 cast iron or steel columns for 15 ft. mounting height. The height out of the ground shall be 12′ 6″, the door opening about 22″ × 6″, and a 22″ × 6″ hardwood baseboard is to be included in the equipment chamber.

9 swan neck brackets for the above, 36″ high, of ¾″ gas tubing.

14 fluted steel columns for 25 ft. mounting height. The door opening shall be about 24″ × 6″, and a 24″ × 6″ hardwood baseboard is to be included in the equipment chamber. The section at the base is to be not less than 8½″ outside diameter by 6 w.g.

14 brackets to above complete with stays and fittings, for use with top entry lanterns. The outreach shall be 6′ and the tube 1¼″ gas.

Tenders in plain sealed envelopes, endorsed " Lighting Columns," but not bearing any name or mark indicating the sender, must reach me not later than noon on 4th November, 1957.

The Council do not bind themselves to accept the lowest or any tender.

T. MYRDDIN BAKER,
Clerk of the Council.

Council Offices,
Grangetown-on-Tees. 923

CITY OF PETERBOROUGH

THE Council invites tenders from recognised electrical contractors for the Electric Lighting and Power Installations to 124 permanent houses and 16 flats on various estates.

Drawings, specifications and forms of tender may be obtained on application to Mr. L. H. Robjohn, M.B.E., A.M.I.C.E., A.M.I.Mun.E., City Engineer and Surveyor, Town Hall, Peterborough.

Applications must be received before noon on Monday, 28th October, 1957, accompanied by a cheque for £2 2s., made payable to the Peterborough City Council. This deposit will be returned on receipt of a bona fide tender or by the return of the documents.

C. PETER CLARKE,
Town Clerk.

Town Hall,
Peterborough. 922

SITUATIONS VACANT

NORTH WESTERN ELECTRICITY BOARD

District Commercial Engineer, Ribblesdale District

DUTIES will include the organisation and control of all commercial staff and functions of the District ; supply of information and advice to all classes of consumers on electricity utilisation, tariffs and all matters concerning electricity services ; organisation and supervision of contract wiring work and maintenance services on consumers' premises ; control of service centres, demonstrations, exhibitions, etc.; organisation and supervision of consumer records.

Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary scale £1,160 × £25 to £1,235 p.a., Grade E.2. N.J.B. conditions.

Applications, naming three referees, to Sub-Area Manager, North Western Electricity Board, No. 5 Sub-Area, Jubilee Street, Blackburn, by 2nd November, 1957. 892

YORKSHIRE ELECTRICITY BOARD

No. 6 (Hull) Sub-Area

HULL DISTRICT

LOCAL MANAGER AND ENGINEER (Beverley).

Applications are invited from chartered electrical engineers possessing a wide experience of operation and maintenance of extensive rural and urban E.H.V. and L.V. networks.

Applicants should be capable of conducting correspondence and of controlling a small administrative and commercial staff, together with their activities.

The successful candidate will be required to reside in Beverley and undertake standby duty. Accommodation will be available.

Salary N.J.B. Class J, Grade 7, £1,065/£25/£1,140 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 31st October, 1957.

No. 5 (Wakefield) Sub-Area

SENIOR DRAUGHTSMAN (Electrical), 2 posts.

Applicants should have had a good general and technical education to O.N.C. standard. Drawing office experience in electrical engineering design in a manufacturer's works for the electricity supply industry would be an advantage.

Salary N.J.B. Schedule D, Grade 5, £760/£20/£860 per annum.

SENIOR DRAUGHTSMAN (Civil and Building), 2 posts.

Applicants should have had a good general and technical education at least to O.N.C. standard. They will be required to prepare drawings of substations, offices, building alterations, etc., and should have had drawing office experience in the design of buildings and in civil engineering work.

Salary N.J.B. Schedule D, Grade 5, £760/£20/£860 per annum.

ENGINEERING DRAUGHTSMAN (Electrical).

Applicants should have had a good general and technical education and have had drawing office experience in the layout and construction of substations of all voltages and wiring diagrams for electrical equipment.

Salary N.J.B. Schedule D, Grade 6, £595/£20/£715 per annum.

CASTLEFORD DISTRICT

ASSISTANT CONSUMERS' ENGINEER.

The successful applicant will be required to negotiate new and increased supplies to small industrial and commercial consumers, conduct street lighting negotiations, deal with tariff queries and special applications, assist in the development of the electric space heating load, supervise installation inspectors and will be required to render general assistance to the consumers' engineer.

Preference will be given to those candidates who have attained the technical standard of the Ordinary National Certificate in Electrical Engineering.

Salary N.J.B. Class F, Grade 13, £590/£15/£635 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, not later than 31st October, 1957. 927

***Situations Vacant** (continued)*

CENTRAL ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following vacancies in this Division :—

SHIFT CHARGE ENGINEER,
WARWICK POWER STATION
(Vacancy No. 178/57/ER).

Applications are invited from qualified engineers for the position of Shift Charge Engineer at Warwick Power Station.

Applicants should have had experience in the operation of steam turbine and boiler plant.

Salary in accordance with Class E, Grade 7 (£835-£880 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 30th October, 1957.

GENERAL ASSISTANT ENGINEER
(Chemist),
CASTLE DONINGTON POWER STATION (Vacancy No. 179/57/ER).

Candidates must have had a sound technical training and some previous laboratory experience and should hold the Ordinary National Certificate in Chemistry.

Salary will be within the range £540-£680 per annum in accordance with the National Joint Board Agreement.

Closing date for receipt of applications, 30th October, 1957.

SENIOR DRAUGHTSMAN (Mechanical),
GENERATION (Construction) DEPT.
(Vacancy No. 180/57/ER).

Candidates should have experience on one or more of the following :—

(i) Design and layout of power station equipment, including turbo-alternators, boiler plant, coal and ash plant and general station auxiliaries.

(ii) H.P. and L.P. steam and feed pipework. Condensing plant and feed heating systems.

(iii) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

Salary will be in accordance with Grade 5 (£760-£860 per annum) or Grade 4 (£895-£995 per annum) of Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications, 30th October, 1957.

PLANT CONTROL ENGINEER,
CASTLE DONINGTON POWER STATION (Vacancy No. 181/57/ER).

Experience desirable in control of boilers and turbines at high pressure and temperature, pulverised fuel, together with electrical control room experience.

Technical qualifications to Higher National Certificate desirable.

Salary will be in accordance with Class L, Grade 10 (£995-£1,055 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 30th October, 1957.

SENIOR DRAUGHTSMAN (Civil),
GENERATION (Construction) DEPT.
(Vacancy No. 159/57/ER).

Candidates should have experience in the preparation of detail drawings and in the design of one or more of the following subjects :—

Reinforced concrete structures.

Piled and slab foundations for heavy components.

Cable subways, bridges and culverts.

Salary will be in accordance with Grade 5 (£760-£860 per annum) or Grade 4 (£895-£995 per annum) of the Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications, 6th November, 1957.

THIRD ASSISTANT ENGINEER
(Electrical),
GENERATION (Construction) DEPT.,
CASTLE DONINGTON
POWER STATION SITE
(Vacancy No. 182/57/ER).

Applicants should have had a fundamental training in electrical engineering, including workshops, and should preferably have had experience in the manufacture, erection and maintenance and operation of electrical plant as installed in modern power stations. Preference will be given to candidates who possess a degree or are Graduate Members of the Institute of Electrical Engineers.

Salary will be within Class AX/EX, Grade 4 (£895-£1,140 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 6th November, 1957.

ASSISTANT ENGINEER (Boiler House),
SPONDON POWER STATION
(Vacancy No. 184/57/ER).

The successful applicant will be required to supervise the operation of the coal and ash handling plant at this station, and to organise coal deliveries by road and rail and disposal of ash. He will also be required to assist the Boiler House Superintendent in the operation of the boiler house.

Experience of similar duties in a large modern power station will be an advantage.

Salary will be within Class H, Grade 9 (£885-£930 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 6th November, 1957.

These appointments will be pensionable within the provisions of the Central Electricity Authority and Area Boards (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. PLEASE QUOTE VACANCY NUMBER.

L. F. JEFFREY,
Divisional Controller.

9th October, 1957. 903

ROLLS-ROYCE

Aero Engine Division

require a

SHIFT CHARGE ENGINEER

for operating electro-mechanical plant to be used for altitude testing of aero gas turbine engines at Derby.

The installation comprises six 20,000 H.P. motor compressor sets, cooling and regeneration turbines, large heat exchangers, refrigeration plant, cooling towers, electro-hydraulic and pneumatic control systems and other ancillary services. The total installed H.P. is 150,000 with a supply voltage of 33,000 volts.

Applicants should have had sound technical training and practical experience in the operation of this type of equipment. Appropriate technical qualifications would be an advantage.

The appointment carries a good basic salary.

Applications will be treated in the strictest confidence and those selected for interview could be seen either in Derby or elsewhere as convenient.

Candidates should write for an application form to :—

The Manager,
Technical Administration,
Aero Division,
ROLLS-ROYCE LIMITED,
P.O. Box 31, Derby.

775

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

North Caledonia Area

THERE is a vacancy with the Maintenance Department, Elgin, for an E.H.T. JOINTER. Applicants should be conversant with all types of jointing up to and, preferably, including 33 kV. Wages and conditions of service in accordance with N.J.I.C. Agreement. A suitable house may be available.

Applications, in writing, giving full details of age, experience, copies of testimonials or references, to the Area Manager, West Villa, South Street, Elgin, before 31st October, 1957. 894

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

NORTHMET SUB-AREA
HEADQUARTERS, LONDON, N.14
(131/57.R)

SENIOR DRAUGHTSMAN
(Ref. 736).

Candidates should have had experience in the preparation of drawings for building and civil engineering work for offices, service centres, workshops, etc., and should be capable of carrying out site surveys and supervising staff.

Salary N.J.B. Schedule D, Grade 5 (£760-£860) plus London allowance.

Apply by letter to C. C. Hill, B.Sc.(Eng.), M.I.E.E., M.I.Mech.E., Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N.14, by 28th October, 1957.

FENS SUB-AREA
(132/57.R)

FOURTH ASSISTANT ENGINEER
(Planning and Development),
SUB-AREA HEADQUARTERS,
MILTON, CAMBRIDGE.

Candidates should have had a good technical education and a thorough engineering training in the industry, but responsible experience in planning is not essential.

The post offers an opportunity to obtain experience over a wide range of planning work.

Salary N.J.B. Class J, Grade 13 (£740-£785).

GENERAL ASSISTANT ENGINEER
(Operation and Maintenance)
(133/57.R).

Applications are invited for position in Southern System based on St. Neots for duty primarily in Huntingdon area.

Candidates should have had a sound technical training, some experience in the operation and maintenance of H.V. and L.V. distribution systems would be an advantage.

Salary N.J.B. Class J, Grade 15 (£635-£680).

Re-issue of notice No. 91/57 N., dated 30th July, 1957. Previous applicants need not reapply ; their applications will be automatically reconsidered.

For both appointments, apply by letter, within 14 days, to the Secretarial Officer, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge. 934

CENTRAL ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following appointments : GENERAL ASSISTANT ENGINEERS.

TILBURY GENERATING STATION
(Ref. Staff Vacancy No. 965)

The station, which is at present under construction, will have an ultimate capacity of 360 MW, when the salaries will increase from Class J to Class K.

Salary within the range of Class J, Grade 17, £580 × £15 to £625 p.a., and Grade 14, £725 × £15 to £770 p.a., inclusive of London weighting, plus 10% shift allowance.

Duties, including periods of shift duty, involve assisting in the operation, testing, efficiency control and maintenance of electrical, boiler and turbine plant and provide a suitable basis for promotion to higher technical grades.

WATFORD GENERATING STATION
(Ref. Staff Vacancy No. 967)

Salary Class E, Grade 13, £580 × £15 to £625 p.a., inclusive of London weighting.

The duties, which form a suitable background for future promotion, include assisting in chemical testing and control and the technical operation of turbine and electrical plant.

Applications, quoting the appropriate reference number, stating age, qualifications, experience and present position, should be sent to the Controller, Central Electricity Authority, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts, to arrive not later than 26th October, 1957.

W. N. C. CLINCH,
Controller. 912

CLASSIFIED ADVERTISEMENTS
ARE PREPAID

CENTRAL ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or B. Salary includes London allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. for posts (a) and Corporate Membership for posts (b) an advantage.

(b) STATION CHEMIST, BRUNSWICK WHARF POWER STATION (Vacancy No. 57/918).

Candidates should be professionally qualified by examination as well as having had some years' industrial experience. The position will entail responsibility for laboratory management and analysis of fuels, oils and waters and matters connected with chemical aspects of power generation. Experience of P.F. and oil-fired plant an advantage. Salary Class K, Grade 7 = £1,210 p.a.

(b) SHIFT CHARGE ENGINEER, FULHAM POWER STATION (Vacancy No. 57/919).

Considerable experience in the operation of a large modern power station necessary. Character and ability to deal with staff problems important. Salary Class K, Grade 7 = £1,210 plus £116 shift allowance p.a.

(a) ASSISTANT SHIFT CHARGE ENGINEER, DEPTFORD EAST POWER STATION (Vacancy No. 57/920).

Sound engineering and technical training with experience in operation of a large modern power station. Salary Class K, Grade 9 = £1,045 plus £99 10s. shift allowance p.a.

(a) STATION SHIFT CONTROL ENGINEER, ST. PANCRAS POWER STATION (Vacancy No. 57/921).

Sound technical training, experience of D.O. and operation of H.T. switchgear. Salary Class E, Grade 10 = £725 plus £68 10s. shift allowance p.a.

OPERATION AND EFFICIENCY ENGINEER, TAYLORS LANE POWER STATION (Vacancy No. 57/922).

Candidates must have initiative and drive with operating experience in a modern power station, including some years as a Shift Charge Engineer, and have knowledge of the principles of combustion, thermal cycles and heat balances, system control and economics of power station operation generally. Candidates should preferably be Corporate Members or Graduates of the I.Mech.E. or I.E.E. Salary Class F, Grade 5 = £1,045 p.a.

MAINTENANCE ENGINEER (Mechanical), TAYLORS LANE POWER STATION (Vacancy No. 57/923).

Applicants should possess initiative and have an appreciation of modern techniques. A fundamental training in mechanical engineering including workshops and experience in maintenance of modern power station plant essential. Applicants should have technical qualifications to H.N.C. standard. Salary Class F, Grade 6 = £985 p.a.

(b) SHIFT CHARGE ENGINEER, WOOLWICH POWER STATION (Vacancy No. 57/924).

Sound practical and technical training necessary with experience in operation and maintenance of boilers, turbines and E.H.T. switchgear, together with character and ability to supervise staff. Salary Class H, Grade 7 = £1,045 plus £99 10s. shift allowance p.a.

THIRD ASSISTANT ENGINEER (Civil), CONSTRUCTION DEPARTMENT, DIVISIONAL HEADQUARTERS (Vacancy No. 57/925).

Successful candidate will work with experienced team directly concerned with design and construction of modern power stations. Opportunities exist to obtain necessary qualifying experience for Institution of Civil Engineers. Frequent visits to sites will be part of normal duties. Salary Class AX/EX, Grade 4 = £945/£1,190 p.a.

FOURTH ASSISTANT ENGINEER (Civil), CONSTRUCTION DEPARTMENT, DIVISIONAL HEADQUARTERS (Vacancy No. 57/926).

Applicants should have had recognised training in civil engineering and preferably some experience in design and specification of power station works. Duties will include office and site work on new and existing stations. Opportunities exist to obtain necessary qualifying experience for Institution of Civil Engineers. Salary Class AX/EX, Grade 6 = £750/£985 per annum.

(b) DEPUTY POWER STATION SUPERINTENDENT, HACKNEY POWER STATION (Vacancy No. 57/927).

Candidates should have received a sound technical and practical training and have had extensive experience in operation and maintenance of a large generating plant. They must also possess good administrative organising and managerial abilities and have experience of labour relations. Salary Class H, Grade 3 = £1,375 p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Authority, London Division, P.O. Box 136, London, W.1, by 28th October, 1957. 895

IMPERIAL CHEMICAL INDUSTRIES LIMITED

Wilton Works

ENGINEERING DESIGNERS

who possess Higher National Certificate or its equivalent, and have experience in the following branches of engineering :

MECHANICAL, CIVIL,
ELECTRICAL, STRUCTURAL,

are required to fill immediate vacancies in the Design Office working on the development of this 2,000-acre factory site, at which is centred much of the company's large expansion programme.

HOUSING : After joining the staff married men will receive a reasonable refund of removal (inclcluding travel) expenses and, to assist them in house purchase, facilities are available in approved cases for substantial loans. In addition, legal charges will be advanced. A lodging allowance will be paid for a period to married men selected for these appointments whilst maintaining two homes.

COMMENCING SALARIES : These vary between £585 and £1,100 per annum according to age, experience and qualifications.

The Design Offices are situated in the parklands of Wilton Castle, which lies at the foot of the Cleveland Hills.

Please write to me : Staff Manager, Imperial Chemical Industries Limited, Wilton Works, Middlesbrough, Yorkshire, quoting reference 428/6.

334

TECHNICIANS

required by

THE ATOMIC WEAPONS RESEARCH ESTABLISHMENT, ALDERMASTON, BERKSHIRE

To be responsible for operation and maintenance of a static substation and a high and low-tension distribution network of underground cables, and for the running and maintenance of all power auxiliary plant. Supervision of industrial staff and the preparation of normal power station statistics involved.

Shift work may be necessary.

A recognised engineering apprenticeship and previous experience of the above type of duties including H.T. electrical generation and steam turbo-alternators in synchronism required.

Applicants should be familiar with the application of the rules for safe working and be qualified to act as an authorised person. O.N.C. in electrical engineering or equivalent qualification essential.

Salary £875 (at age 30 or over) to £1,050 per annum.

Contributory superannuation scheme. A house or assistance towards legal expenses on house purchase will be available for married officers living beyond daily travelling distance.

POSTCARD for application forms to the Senior Recruitment Officer at above address. Please quote ref. A/1577/48. 854

SENIOR SCIENTIFIC OFFICERS; SCIENTIFIC OFFICERS

THE CIVIL SERVICE COMMISSIONERS invite applications for pensionable appointments covering a wide range of scientific research and development in most of the major fields of fundamental and applied science. In Biological subjects the number of vacancies is small : individual vacancies exist in the Natural History Museum for candidates who have special knowledge of, or who are interested in, crystallography, taxonomic entomology, palæobotany, malacology, acarology.

The Royal Naval Scientific Service requires a Scientific Officer (male) for the National Institute of Oceanography to work on oceanic Cephalopoda ; and a vacancy for a Metallurgist (Scientific Officer) has arisen in the Royal Mint.

Candidates must have obtained a university degree with first or second class honours in an appropriate scientific subject (including engineering) or in mathematics, or an equivalent qualification, or be otherwise qualified by high professional attainments. Candidates for Senior Scientific Officer posts must in addition have had at least three years' postgraduate or other approved experience.

Age limits : Senior Scientific Officers, between 26 and 31, but specially suitable candidates under 26 may be admitted ; for Scientific Officers, between 21 and 28 during 1957 (up to 31 for permanent members of the Experimental Officer class).

Salary (London) : Senior Scientific Officers, minimum £1,190 (women £1,098), men's scale maximum £1,410 ; Scientific Officers, minimum £635, men's scale maximum £1,110. Women's pay above £635 slightly lower but being raised to reach equality with men's in 1961. Somewhat lower rates in the Provinces. 5-day week, generally.

Further particulars from Civil Service Commission, Scientific Branch, 30, Old Burlington Street, London, W.1, quoting No. S.53/57 for Senior Scientific Officers and S.52/57 for Scientific Officers.

Interview boards will sit at intervals, as required. Early application is advised. 902

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT COMMERCIAL ENGINEER,
Central Sussex District.

Salary £835 p.a. rising to £880 p.a. under N.J.B. Schedule, Class F, Grade 8.

Applicants must have had extensive experience in contracting and consumer service and be able to prepare specifications and estimates for domestic, commercial and industrial installations. A knowledge of farming applications would be an advantage.

Applications, naming two referees, to Arthur Barnes, M.I.E.E., Central Sussex District Manager, SEEBOARD, Electra House, Church Road, Haywards Heath, by 30th October, 1957.

TRAINEE DEMONSTRATOR (FEMALE),
Croydon and Purley District.

Salary £224-£485 rising to £506 per annum plus London weighting. Superannuable.

Applicants should have taken a course of training in domestic science and obtained a certificate. The successful applicant will receive training as a demonstrator of household electrical appliances and will be required to assist generally in the district showrooms.

Applications, namnig two referees, on forms from H. Lowe, M.I.E.E., District Manager, SEEBOARD, Electric House, Wellesley Road, Croydon, by 30th October, 1957.

ELECTRICAL FITTERS,
Sutton District.

Wage 4s. 11½d. per hour for 44-hour 5-day week under N.J.I.C. Agreement.

Applicants should have had experience in the erection and maintenance of E.H.T. switchgear and general installation work.

Applications, naming two referees, on forms from W. B. Hayden, M.I.E.E., District Manager, SEEBOARD, 52, High Street, Sutton, Surrey, by 28th October, 1957.

A. L. BURNELL,
Secretary. 929

FOREMAN ARMATURE WINDER

NORTH-Eastern firm of electrical engineers require first-class man conversant with all types and classes of machines to take charge of expanding department. Generous remuneration by wage and bonus. Excellent opportunity. —Box 858.

***Situations Vacant** (continued)*

THE EAST AFRICAN LAND FORCES ORGANISATION

require the following civilian staff for service in KENYA:—

(a) STAFF AND PLANNING OFFICER (M2A/42473/EF).
(b) WORKSHOP SUPERINTENDENT (M2A/42474/EF).
(c) SENIOR SUPERVISING TECHNICIAN (M2C/42471/EF).

Appointment on contract for one tour of 24-45 months in first instance. Salary scales (including inducement pay) for (a) £1,383 rising to £1,566 a year and for (b) and (c) £1,215 rising to £1,566 a year. Commencing salary according to age, qualifications and experience. Gratuity at rate of 13½% of total salary drawn. Outfit allowance £40 payable in certain circumstances. Free passages. Liberal leave on full salary.

Candidates, 30-50 years of age, for (a) must be A.M.I.Mech.E. or A.M.I.E.E., or have Staff Officer experience in R.E.M.E. not below D.A.D.M.E. (Tech.), and be capable of carrying out surveys of army equipment requiring repair and controlling local purchase and local contracts.

Candidates for (b) must be A.M.I.Mech.E. or A.M.I.E.E. or have served an apprenticeship to motor or mechanical engineering and have had considerable military engineering experience as Workshop Superintendent in R.E.M.E., including the repair and testing of vehicles, supervision of ancillary departments and preparation of damage reports, job cards, etc.

Candidates for (c) must have served apprenticeship in electrical engineering, be able to supervise the inspection and repair of telecommunications equipment and instruments, and be fully conversant with military fire control and telecommunication equipment. Preference will be given to candidates who are Corporate Members I.E.E.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote the reference number shown against the post applied for. 896

M.K. ELECTRIC LIMITED

are enlarging their Sales Force in the North and

REQUIRE ADDITIONAL REPRESENTATIVES

for parts of Lancashire and Yorkshire.

If you have experience in dealing with architects, electrical wholesalers and contractors, are a car owner, and would like to join the sales team of a progressive company marketing products with a world-wide reputation, we would like to hear from you in confidence.

Write in the fullest detail to—

The Sales Manager
M.K. ELECTRIC LTD.
Wakefield Street
London, N.18

687

ELECTRICAL ENGINEER

required (aged 30-45, preferably chartered) to assume progressive leading position, at attractive salary, in design office of London company. Applicants must be fully conversant with low and medium-voltage automatic contactor gear, motors, relay systems, and methods of temperature control. Previous D.O. experience and a thorough knowledge of wiring systems applied to precision machinery is essential.

Write in first instance to Personnel Manager, Molins Machine Co. Ltd., Evelyn Street, London, S.E.8.

867

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

North Staffs Sub-Area

DISTRICT ENGINEER (Congleton District). Applicants should have had a sound technical training and extensive experience in the construction, operation and maintenance of High Voltage and Low Voltage distribution networks and associated switchgear, transformers and protective systems. Technical qualifications desirable. Salary £995/£1,055 per annum (N.J.B. Grade D3).

THIRD ASSISTANT DISTRICT ENGINEER (Stone/Market Drayton District). Applicants should have had experience in all branches of distribution work including construction, operation and maintenance of medium and high voltage underground cables, overhead lines and substations, and the maintenance and testing of switchgear up to 11 kV. Technical qualifications desirable. The successful applicant will be responsible for the district engineering staff located in Market Drayton and will be required to reside there. Salary £740/£785 per annum (N.J.B. Grade E.9).

Apply by letter within 14 days, stating age, qualifications, experience, present salary and position, to Mr. H. A. P. Caddell, Sub-Area Manager, Midlands Electricity Board, 234, Victoria Road, Fenton, Stoke-on-Trent.

A. STEPHENS,
Secretary.

932

'ENGLISH ELECTRIC'

London, S.W.1
Transformer Drawing Office

GOOD TRANSFORMER DRAUGHTSMEN as well as MECHANICAL DRAUGHTSMEN are required for work on the heavier range of transformer manufactured by the company (30 MVA—350 MVA).

These are permanent staff appointments carrying excellent salaries and offering opportunity for advancement within the Group to men who wish to progress.

This new office is pleasantly appointed in a modern office block 5 minutes from Victoria Station.

There are also attractive openings for JUNIOR DRAUGHTSMEN in this office.

We would also like to hear from Senior and Junior Draughtsmen interested in similar work at our STAFFORD works.

Please write giving full details to Central Personnel Services, 336/7, Strand, London, W.C.2, quoting Ref. ER.1299B.

695

THE GENERAL ELECTRIC COMPANY LIMITED

have vacancies for

Operating Engineers

for the Operational Service Department of their Turbine Division.

Appointments will be based on Erith, Kent, and the work involves diagnosis and investigation of operating problems on turbines from 325 kW to 120,000 kW and on blowers up to 90,000 c.f.m.

Minimum qualification is H.N.C. (Mechanical or Electrical) and applicants must possess initiative and determination. Sound power station experience is essential and the posts are very suitable for men with experience as a shift engineer in a large power station.

Applications giving age and details of training and experience should be addressed to Personnel Manager (T), The General Electric Company Limited, Fraser & Chalmers Engineering Works, Erith, Kent.

869

CITY OF BIRMINGHAM PUBLIC WORKS DEPARTMENT

Vacancies in the Public Lighting Section

(a) ELECTRICAL ENGINEERS. Grade A.P.T. III (£845/£1,025 p.a.)
(b) HEATING AND VENTILATING ENGINEERS. Grade A.P.T. III (£845/£1,025 p.a.)

For posts (a) applicants should be Associate Members of the Institution of Electrical Engineers or hold equivalent qualifications. They should have experience in the design, specification and supervision of contracts for electric lighting and power installation in large buildings.

For posts (b) applicants should be Associate Members of the Institution of Mechanical Engineers and/or the Institution of Heating and Ventilating Engineers, or hold equivalent qualifications. They should have experience in the design, specification and supervision of contracts for heating, ventilating and allied services in large buildings.

The posts are permanent, superannuable and subject to a medical examination.

Applications stating qualifications, age and experience, and naming two referees, should reach the undersigned by the 2nd November, 1957.

Canvassing disqualifies.

HERBERT J. MANZONI,
Civic Centre, City Engineer and Surveyor.
Birmingham, 1. 865

CENTRAL ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following positions:—

SECOND ASSISTANT STATION CHEMIST, EARLEY GENERATING STATION (S/13.954).

Applicants should have had practical experience of fuel, water and oil testing appropriate to a modern generating station, and a knowledge of boiler chemistry for high steam pressures and temperatures will be an advantage. Preference will be given to candidates with H.N.C. in Chemistry or equivalent qualifications.

Salary N.J.B. Class G, Grade 11, £740-£785.

ASSISTANT SHIFT CHARGE ENGINEER, POOLE GENERATING STATION (S/13,955).

Applicants should have had previous experience in a large modern generating station, and preference will be given to those with experience of high operating temperatures and pressures, and pulverised fuel equipment. Manufacturing works experience will be an advantage.

Preference will be given to those who possess qualifications leading to corporate membership of a recognised professional institution, or those holding appropriate equivalent qualifications.

Salary N.J.B. Grade J.9, £935-£995.

Special application forms obtainable from P. D. A. Oliver, Divisional Secretary, 111, High Street, Portsmouth, should be returned by 30th October, 1957. 933

NUCLEAR POWER STATIONS

ELECTRICAL and MECHANICAL ENGINEERS and DRAUGHTSMEN are required by A. Reyrolle & Company Ltd., at Hebburn for the development of electro-mechanical and mechanical equipment and special scheme for the control of nuclear reactors and for the design and development of main and auxiliary switchgear and associated control circuits used in power stations.

Direct appointments will be made to applicants having suitable experience and qualifications (Ordinary or Higher National Certificate; Degree or equivalent). Others who have received engineering training and have attained at least the S2 standard will be considered for training. Salaries will be appropriate to age, experience and qualifications.

All appointments are pensionable and offer scope of advancement. Assistance with house purchase can be arranged.

Applications, quoting Ref. NP/1, and stating full particulars should be made to the

Chief Engineer
A. REYROLLE & COMPANY LTD.
Hebburn, Co. Durham 928

CENTRAL ELECTRICITY AUTHORITY

South Western Division

GENERAL ASSISTANT ENGINEER (Maintenance) required at East Yelland Power Station. Superannuation scheme. Salary N.J.B. Class H, Grade 12, £740-£785.

Applicants should have had a sound general and technical education and training. Possession of the Ordinary or Higher National Certificate in Mechanical and/or Electrical Engineering considered an advantage.

GENERAL ASSISTANT ENGINEER required at Portishead "B" Power Station. Superannuation scheme. Salary N.J.B. Class J, Grade 15, £635-£680. (Ultimate classification of Station, "K.")

Preference given to candidates who hold or are at present studying for a Higher National Certificate or similar qualification.

FOURTH ASSISTANT ENGINEER required in Transmission Department at Divisional Headquarters, Bristol. Superannuation scheme. Salary N.J.B. Class AX/CX, Grade 5, £810-£935/£985.

Construction engineer required to assist in the co-ordination and supervision of high-voltage overhead line contracts. Experience in survey and in the design of profiles for such lines would be an advantage.

Application forms for the above vacancies may be obtained from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, and should be completed and returned by 4th November, 1957. 924

CENTRAL ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for the following positions in the Testing Section of the Chief Generation Engineer's (Operation) Department based at Nechells "A" Power Station, Birmingham. N.J.B. service conditions, superannuable appointments, salaries within Schedule B of the Agreement.

(a) THIRD ASSISTANT ENGINEER, Grade 4, commencing salary in range £895-£1,020, ultimately rising to £1,140 per annum (Vacancy No. 659MD).

(b) Two FOURTH ASSISTANT ENGINEERS, Grade 6, commencing salary in range £710-£835, ultimately rising to £935 per annum (Vacancy No. 660MD).

Applicants should possess for :—

(a) Suitable qualifications in mechanical engineering with preferably some electrical training. They should have sound experience in plant testing, particularly turbines, and should be capable of critical assessment of test results.

(b) Suitable engineering qualifications, with preferably some experience in plant testing.

Apply, quoting vacancy number, on form AE6, available from the Establishments Officer, 53, Wake Green Rd., Moseley, Birmingham, 13, by 2nd November. 891

NATIONAL COAL BOARD

North Eastern Division

TWO SHIFT CHARGE ENGINEERS required at the Grimethorpe Generating Station (60 MW) in No. 4 (Carlton) Area. Salary range £675-£1,075.

Applicants should have had experience in modern power station practice, with chain grate stokers burning inferior fuel. Preference will be given to those applicants possessing the Higher National Certificate (or equivalent) and being a corporate member of a recognised institution.

Apply to No. 4 Area Staff Manager, Grimethorpe, near Barnsley, by 25th October, 1957. 897

SOUTH WALES ELECTRICITY BOARD

require an ASSISTANT ENGINEER, District 348 (Cardiff West) in the Central Sub-Area of the Board.

Salary Class E, Grade 9 (£740/£785) of the N.J.B. Agreement.

Applications stating age, present position and salary, qualifications, experience, and three referees, should be addressed to the Secretary (Establishments Section), St. Mellons, Cardiff, so as to reach him not later than Monday, 28th October, 1957. 901

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the post of THIRD ASSISTANT ENGINEER in the Planning and Economics Section of the Chief Commercial Officer's Department at Board Headquarters.

Applicants should have had a sound engineering training to at least Higher National Certificate standard and should have had experience in the engineering or commercial departments of an electricity supply undertaking.

The duties will comprise general work on the economics of electrical generation and supply, including the collection and interpretation of technical statistics for technical costing and tariff analysis.

The position is superannuable and the salary will be in accordance with N.J.B. Schedule B, Class AX/DX, Grade 4, £895/£1,110 per annum.

Applications should be made on the standard form, which may be obtained from the undersigned, and should reach this office not later than Saturday, 2nd November, 1957. Please quote reference No. C6/57.

ANDREW A. WALLACE,
Secretary.
P.O. Box 173,
351, Sauchiehall Street,
Glasgow, C.2.
8th October, 1957. 931

BROOKHIRST SWITCHGEAR LIMITED

Chester

have several vacancies for

SENIOR AND JUNIOR SALES ENGINEERS

at their Branch Offices.

BROOKHIRST, specialists in electric motor control gear for nearly sixty years, and still leading the way with their application of motor control to nuclear power schemes, chemical and highly mechanised industrial plants, etc., offer challenging but satisfying jobs to men interested in sales work in this field.

It is desirable that applicants should hold a current driving licence since a car is provided for the use of certain branch office staff.

Successful applicants will receive assistance towards the cost of removal, should this be necessary.

The company operates a pension scheme, and in certain cases a transfer of pension contributions can be effected to the scheme.

Apply in writing, giving brief details of age, qualifications and experience, to the

Personnel Officer,
Brookhirst Switchgear Ltd.,
Northgate Works,
Chester,

who will deal with the applications in complete confidence. 898

ELECTRICAL ENGINEERS (SENIOR GRADE)

required by the Electricity Authority of Cyprus for two tours each of two years, with prospect of permanency. Salary (including bonus and overseas and temporary allowances) in scale £2,054 rising to £2,265 a year. Superannuation scheme and medical fund. Outfit and settling-in allowances totalling £35 (£75 if accompanied by wife). Free passages and furnished quarters. Children's educational grants in certain circumstances. Liberal leave on full salary.

Candidates must have had sound training in both electrical and mechanical engineering with experience in charge of District or equivalent, and have competent knowledge of operation, maintenance and development of underground and overhead systems up to 11 kV.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/41525/EF. 868

ELECTRICAL DESIGN ENGINEER

ELECTRICAL DESIGN ENGINEER required for work on special rectifiers Applicants should hold H.N.C. in Electrical Engineering or equivalent.

Excellent canteen and welfare facilities. Five-day week. Superannuation scheme.

Apply or write: The Personnel Supervisor, Siemens Edison Swan Ltd., Brantwood Road, Tottenham, London, N.17. 678

HIGH-VOLTAGE ENGINEERING

FERRANTI LIMITED, HOLLINWOOD, LANCS.

invites applications for the following vacancies in the

HIGH-VOLTAGE EQUIPMENT DEPARTMENT.

1. GRADUATE ELECTRICAL ENGINEERS with previous design experience in power engineering for original design development work in the high-voltage field.

2. ELECTRICAL ENGINEERS possessing Higher National Certificate or Diploma to be trained for design work.

The company operates a staff pension scheme and a dependants' insurance scheme. Forms of application can be obtained from T. J. Lunt, Staff Manager, Ferranti Ltd., Hollinwood, Lancs. Please quote reference DNC. 774

BOROUGH OF WILLESDEN

Borough Engineer and Surveyor's Dept.

ELECTRICAL ENGINEERING ASSISTANT

APPLICATIONS are invited for the following appointment: Electrical Engineering Assistant, Special Grade (£750-£1,030 p.a.).

London weighting, maximum £30 p.a., is payable in addition to the above salary.

Candidates should possess appropriate qualifications and should have experience in the design and maintenance of electrical equipment and installations.

The Council cannot assist with housing.

Full details and form of application may be obtained from the Borough Engineer and Surveyor, Town Hall, Dyne Rd., Kilburn, London, N.W.6, and must be returned to the undersigned not later than 9 a.m. on Monday, 4th November, 1957.

(Sgd.) R. S. FORSTER,
Town Clerk.
7th October, 1957. 866

DRAUGHTSMEN

are required for work on the

MECHANICAL DESIGN OF LARGE ROTATING ELECTRICAL MACHINERY.

Experience in this class of work will be an advantage, but is not essential.

These pensionable positions, with attractive salaries, are in a recently modernised drawing office, where interesting work on an expanding programme is being carried out.

Trainees of S2, O.N.C. standard will also be considered.

Applications from former members of the large electrical machine drawing office will be welcomed.

Write for application form, quoting reference X.9, to :—

Personnel Manager
METROPOLITAN-VICKERS ELECTRICAL CO. LTD.
Trafford Park, Manchester, 17

797

BURCO LTD.

Burnley
Lancs

EXPANSION OF SALES FORCE

APPLICATIONS are invited from men under 40 with selling experience in the electrical industry. Good salary, prospects and expenses. Transport provided. Pensionable.

ASSISTANT SALES REPRESENTATIVE for the Yorkshire Electricity Board Area, resident in the vicinity of Leeds.

SALES / SERVICE REPRESENTATIVES required for the following areas:—

The Yorkshire Electricity Board, resident in S. Yorks.

The North Western Electricity Board, resident in the Preston/Lancaster area.

The Eastern Electricity Board, resident in the region of Norwich.

Full details of past experience, etc., to Burco Ltd. 925

***Situations Vacant** (continued)*

NORTH EASTERN ELECTRICITY BOARD

Wear Sub-Area

APPLICATIONS are invited for the appointment of THIRD ASSISTANT ENGINEER, Commercial Officer's Department, Sub-Area Headquarters, Sunderland.

Applicants should preferably be Associate Members or Graduates of I.E.E. or possess equivalent qualifications, and have experience of the utilisation of electricity in industrial, commercial and domestic premises, particularly in relation to space heating, water heating and heavy duty cooking.

Salary Schedule A. Class L, Grade 10, £995/£1,055 per annum. N.J.B. conditions of service.

Applications, stating age, qualifications and experience, to be received by the Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 926

CHIEF DESIGNER

required to take charge of the design section of the company, responsible to the Chief Engineer for the carrying out of the standard and contract design programme. Applicants should preferably be chartered engineers or have equivalent technical qualifications and must have experience of oil circuit breaker design, and preferably, in addition, experience of air breaker, control gear, and/or starter design. Although this is a senior post with an equivalent emolument for the responsibility involved, the duties are not purely supervisory and will also involve creative design work.

Applications, giving full details of education, qualifications and experience, should be sent to the Managing Director, Erskine, Heap & Co. Ltd., Salford, Manchester, 7. 857

NORTH WESTERN ELECTRICITY BOARD

Second Assistant District Engineer, Kearsley District

DUTIES will include the operation, maintenance and construction of underground and overhead mains, substations and transformers, and general mains work, including standby duty. Applicants should state their experience in high-voltage mains work.

Applicants should hold H.N.C. in Electrical Engineering, and Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary scale £995 × £20 to £1,055 p.a., Grade H.7. N.J.B. conditions.

Applications, naming three referees, to Sub-Area Manager, No. 2 Sub-Area, North Western Electricity Board, 2, St. George's Road, Bolton, by 26th October, 1957. 893

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for a position as SHIFT CHARGE ENGINEER at Portobello Generating Station, Edinburgh. Applicants should have had experience with high pressure pulverised fuel generating plant and, preferably, possess a Higher National Certificate in Electrical or Mechanical Engineering. Salary N.J.B. Class K, Grade 7, £1,160/£1,235 per annum, plus shift allowance of 10%. The position is superannuable.

Forms of application may be obtained from the Secretary, South of Scotland Electricity Board, 168, Broomhill Drive, Glasgow, W.1, and should be returned not later than 1st November, 1957. 900

FACTORY ELECTRICAL MAINTENANCE FOREMAN

required for maintenance and installation in large factory situated in Coventry. Applicants should be able to prove previous experience in a similar position, although this need not discourage young electricians seeking advancement.

Monthly staff position.

Superannuation scheme.

Full particulars of experience, age, availability, salary required, etc., in confidence, to—Box 809.

MIDDLESEX COUNTY COUNCIL EDUCATION COMMITTEE

Southall Technical College
Beaconsfield Road, Southall, Middlesex

Required 1st January, 1958:—

LECTURER to teach ELECTRICAL ENGINEERING to Higher National Certificate and Higher National Diploma standard.

Salary in accordance with the Burnham (Technical) Report 1956, i.e. £1,200 × £30 to £1,350 plus London allowance.

Applications giving details of qualifications, teaching and industrial experience should be sent to the Principal within 7 days of the appearance of this advertisement.

C. E. GURR, M.Sc., Ph.D.
Secretary to the Education Committee. 930

A.E.I.—JOHN THOMPSON NUCLEAR ENERGY CO. LIMITED
Radbroke Hall, Knutsford, Cheshire

SENIOR ENGINEER. A vacancy exists for an engineer experienced in power station design and construction, with particular reference to the technical co-ordination of complete projects. He will be required to take charge of independent design office staffs either in this country or overseas. A knowledge of construction planning is essential.

The company is prepared to assist with house purchase where necessary. A contributory pension scheme is in operation.

Applications giving details of age, experience and qualifications, which will be treated in strict confidence, should be addressed to the Chief Engineer, quoting reference "J.R.M.S." 723

CABLE ENGINEER

A LARGE C.M.A. firm in London area has a vacancy for a young engineer on design and development work in connection with rubber and plastic insulated cables. O.N.C., or preferably H.N.C., in Electrical Engineering essential. Previous experience very desirable, but lack of it would not disqualify a good man.

Salary commensurate with age, experience and qualifications.

Full details please in confidence to—Box 840.

NUCLEAR RADIATION DETECTORS

A VACANCY for an EXPERIMENTAL OFFICER exists in the Group dealing with the design and development of these detectors, including gas ionisation chambers and counters, at the ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL.

Knowledge of appropriate techniques and experience in vacuum technology required. Experience in nuclear measurements an advantage.

Minimum qualification G.C.E. "A" level or H.N.C. in Physics or Electrical Engineering (or equivalent).

Salary £990-£1,215.

Housing, superannuation and excellent conditions.

Send POSTCARD for application form to Recruitment (927Z/48), A.E.R.E., Harwell, Didcot, Berks. 855

CENTRAL ELECTRICITY AUTHORITY

Midlands Division

SHIFT CHARGE ENGINEER is required at Meaford "B" Power Station, near Stone, Staffs. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade J.7, £1,065 to £1,140 per annum, plus 10% shift allowance.

A sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear are required. Knowledge of pulverised fuel firing would be an advantage, and appropriate qualifications desirable.

Apply, quoting Vacancy No. 662MD, on form AE6, available from the Establishments Officer, 53, Wake Green Rd., Moseley, Birmingham, 13, by 2nd November, 1957. 890

WILTSHIRE COUNTY COUNCIL

Education Committee

North-West Wiltshire Area College of Further Education

APPLICATIONS are invited for the post of ASSISTANT GRADE "B" in January, 1958, to teach Mathematics and Engineering subjects to National Certificate and City and Guilds standards.

Salary in accordance with the Burnham Salary Scale, viz., £650 to £1,025 by £25, with allowances for graduations and training.

Further information and application forms may be obtained from the Principal, Cocklebury Road, Chippenham, Wiltshire. 856

BRITISH KLOCKNER SWITCHGEAR LIMITED
Chertsey, Surrey

ESTIMATOR for TECHNICAL SALES. Correspondence and capable of preparing control schemes involving automatic motor control gear. Experience essential.

CIRCUIT DIAGRAM DRAUGHTSMAN. Preferably experienced in preparing automatic control gear schemes.

Applicants to have O.N.C. (Electrical). Excellent opportunities with fast growing concern. Pension scheme. Apply to Managing Director, stating experience and present salary. 165

Applications are invited by
THE BENJAMIN ELECTRIC LTD.
for a
DESIGNER OF INDUSTRIAL LIGHTING EQUIPMENT.

Knowledge of fabricating techniques, finishes, lamps and control gear desirable, but initiative and ideas equally important.

Apply Chief Technical Engineer, Brantwood Works, Tottenham, London, N.17. 899

BIRMINGHAM REGIONAL HOSPITAL BOARD

ASSISTANT ENGINEER (Electrical). Salary £700-£1,015 p.a. Starting salary according to age, experience and qualifications. Applicants must be Graduate I.E.E. or hold other approved qualifications. Duties include site surveys, preparation of plans and specifications for electrical services and supervision of new works in hospital premises. Superannuable. Apply Secretary, 10, Augustus Road, Birmingham, 15, immediately. 916

SURREY COUNTY COUNCIL

APPLICATIONS invited for appointment of ELECTRICAL INSTALLATIONS DRAUGHTSMAN GRADE I, £543 5s. to £625 5s. p.a. plus London allowance of up to £30 p.a. according to age.

Full details, present salary and three copy testimonials to County Architect, County Hall, Kingston-on-Thames, as soon as possible. 806

BRITISH KLOCKNER SWITCHGEAR LIMITED
Chertsey, Surrey

TECHNICAL SALES ENGINEERS required for London and Home Counties. Knowledge of motor control gear; sales experience preferred but not essential. Apply giving full particulars to—Managing Director. 166

A POWER engineer with O.N.C. or equivalent in Electrical Engineering required to assist in engineering, testing and inspection of automatically controlled power plant for telephone exchanges. Good opportunity to broaden experience. Give details of previous employment, education and salary required, to—Staff Officer, Ref. 744/89, Siemens Edison Swan Ltd., Woolwich, London, S.E.18. 841

ADDITIONAL representatives required. Experience in electrical trade essential.—Universal Distributing Co. Ltd., 66/68, Great Eastern Street, London, E.C.3 (Phone, BIS. 6777). 776

A.M.I.E.E. with commercial outlook required for eventual appointment as area manager for S.W. England. Write — Sales Director, Gresham-Lion Group Limited, Gresham House, Feltham, Middx. 884

APPLICATIONS are invited from electrical design draughtsmen for positions embracing circuitry, control gear design and layout relating to special-purpose machinery. The positions offer scope, good salary and are pensionable. Apply with details of experience to—The Chief Electrical Engineer, British Federal Welder & Machine Co. Ltd., Castle Mill Works, Dudley, Worcs. 937

APPLICATIONS are invited from young university graduates or men with Higher National Certificates to undertake technical development and research work on the mechanical side of switchgear and circuit breaker operation. Applications to give age, education and details of experience to the Personnel Manager, South Wales Switchgear Ltd., Blackwood, Mon. 872

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE Co. Ltd., 24, Fennel Street, Manchester, 4. Electrical surveyors required for various districts in Great Britain. Permanent positions carrying progressive salary scale £735 to £1,060 and non-contributory pension. Candidates, age 26 to 32, preferably with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply in own handwriting, stating age, qualifications and experience. 888

CIRCUIT design draughtsmen required by company manufacturing industrial control equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middx. 273

CONSULTING engineers require electrical designer draughtsman experienced in all classes of lighting and power installation for hospitals, schools, industrial projects, preparation of contract documents, specifications, etc. Good salary and bonus. Preference to Graduate or Associate Member of Institution of Electrical Engineers. Reply to—A. F. Myers & Partners, 147, Victoria Street, London, S.W.1. 871

CONTRACTORS, progressive, in central London require senior designer draughtsman and also junior for electrical installations of all descriptions. Excellent prospects. Write experience and salary required.—Box 657.

DEWHURST & PARTNER Ltd., of 21, Park Street, Leeds, 1, require the services of an energetic sales engineer to assist in dealing with an expanding market for their products. The field covers the entire application of motor control gear, but with special reference to the heavy industries, i.e., steel mills, etc., and the successful applicant must be capable of sales negotiations at reasonable levels in industry. He must have a sound engineering background, and the applicant will be required to work in the Leeds or Sheffield areas. A car will be provided. In the first instance, please apply in confidence to Mr. Thorp at the above address, stating age, qualifications, selling experience and salary required. 905

DEWHURST & PARTNER Ltd. require technical estimator for preparing tenders in their estimating engineering department. Applicant must have good electrical engineering background and have basic knowledge of motor control equipment and its applications. The position is a senior one, and housing assistance will be given to successful applicant if necessary. Canteen facilities, pension scheme. Write giving age, experience, etc., to — Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middlesex. 274

DRAUGHTSMAN (senior jig and tool), experienced in the design of press tools for the mass production of precision stampings and press parts. Knowledge of progression tools and their application to dieing presses an advantage. High salary offered to draughtsman with this specialised experience. Apply in writing, giving details of experience and salary required, to—General Works Manager, M.K. Electric Limited, Wakefield Street, Edmonton, London, N.18. 690

ELECTRICAL contractors (Newcastle) require an estimating engineer with sound practical and technical knowledge. Progressive position. Write stating age, previous experience and commencing salary.—Box 790.

ELECTRICAL draughtsman. National Certificate standard or equivalent in electrical engineering. Experienced in electrical switchgear and distribution diagrams, automatic contactor switchgear for motor control. Previous paper mill experience preferred. Apply in writing giving details of age, training and experience to—Bowaters United Kingdom Pulp and Paper Mills Limited, Thames Division, Northfleet, Kent. 859

ELECTRICAL draughtsman, preferably National Certificate standard or equivalent, for switchgear design and distribution diagrams, with ability and initiative at a later stage to control small drawing office. Staff pension scheme and canteen facilities in operation. Possibilities of house accommodation for successful applicant. Apply—Peppers of Woking Ltd., Stanhope Road, Camberley, Surrey. 779

ELECTRICAL draughtsman required by consultants, preferably with H.N.C. and having experience in the design and layout of lighting and power installations. Write giving particulars of age, qualifications, experience and present employment to — Rendal, Palmer & Tritton, Consulting Engineers, 125, Victoria Street, London, S.W.1. 885

ELECTRICAL engineer required for London firm of consulting engineers. Previous experience in the design and specification of installations in schools, hospitals, etc., desirable but not essential. Write stating age, salary required and brief details of qualifications and experience to—Box 864.

ELECTRICAL engineer required in Northern Ireland to superintend the erection and setting to work of 33-kV and 110-kV outdoor type switching stations. Experience with electrical equipment in large thermal power stations would be an additional asset. Reply—Reference HHJ, Kennedy & Donkin, 12, Caxton Street, London, S.W.1. 886

ELECTRICIAN/electrical mechanic, first-class, experienced all types installations, required by large London electrical company, 12 months' service overseas. Excellent opportunity. Write age, experience, references.—Box 782.

ELECTRICIAN, London rates.—Leonard J. Ive, 29 Clarendon Rd., Watford (Phone 4030). 9136

ELECTRICIANS required for day and shift work on maintenance of paper mill plant. Good rates of pay and proficiency bonus. Sick benefit and contributory pension schemes. canteen and sports facilities.—Bowaters United Kingdom Pulp and Paper Mills Limited, Thames Division, Northfleet, Kent. 860

ELECTRO-mechanical draughtsmen required for production drawing office of company engaged in the manufacture of control gear equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middx. 275

ENGINEER required for tool planning. The successful applicant will be required to take control of (i) planning of tooling; (ii) estimating tooling costs; (iii) design of tools. Applicants should have some years' experience in the design of medium-sized press tools, jigs and fixtures, and hold a degree or Higher National Certificate. The post is a senior one and admits to an attractive pension scheme. Please apply, giving full particulars, to—Personnel Manager, Small Electric Motors Ltd., Churchfields Road, Beckenham, Kent. 941

ENGINEER required to develop contactless control of electrical machinery. Experience with magnetic amplifiers and transistors an advantage but not essential. Applications to the Personnel Officer, Igranic Electric Co. Ltd., Bedford. 920

FURTHER expansion at Birlec Limited, Tyburn Road, Birmingham, 24. Required urgently, electrical engineers for engineering design departments to handle a wide range of electrical plant associated with electric furnaces. The work includes application engineering, circuit design, preparation of specifications and technical correspondence. Engineers with good technical training should apply at once, minimum qualification acceptable for junior positions being O.N.C. Electrical Engineering with continuation of study for H.N.C. These positions offer good prospects in an extremely interesting field of electrical engineering involving electrical plant for L.T. and H.T. systems with furnace loads up to 50 MVA at 132 kV. Apply in writing to Personnel Manager (WLH). 870

ESTIMATING engineer required by electrical contractors in Manchester. Excellent opportunity for suitable man aged 20/30. Industrial installations only. Give details of previous experience and salary required.—Box 9162.

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EXPERT in purchase and sale of re-usable cable required to undertake sole management of department dealing in this commodity for important firm of metal merchants and manufacturers. Salary and generous participation in profits. Splendid opportunity for man of experience and initiative. All replies will be treated in strict confidence.—Box 875.

HENNIKER, THEWSEY Ltd. offer a fine opportunity, due to expanding business, to an engineer who would like to make the sale of transformers and switchgear manufactured by a well-known Scottish firm his career, with an established connection as a basis. A person with small initial capital to take an immediate directorship is preferred, but lack of capital would not prevent the appointment of a man otherwise suitable. Residence in South Scotland essential. Replies, treated in strict confidence, to Man. Dir., H.T. Ltd., 29, Templeland Road, Edinburgh, 12. 9151

JOINTER, cable, fully experienced both H.T. and telephone jointing, required by large London electrical company, 12 months' service overseas. Excellent opportunity. Write age, experience, references.—Box 781.

JUNIOR engineer required for the supervision of cable installation contracts in the North London area. Applicants must be capable of controlling rough labour and taking as laid sketches to customers' requirements.—Box 861.

LAURENCE, SCOTT & ELECTROMOTORS require estimator for their London office for quotations covering A.C./D.C. motors and control gear. Some experience of commercial electrical engineering desirable. Applications to — Reference LO1, Laurence Scott & Electromotors, 376, Strand, London, W.C.2. 889

LONDON consulting engineers opening offices in Croydon require engineers and draughtsmen to design electrical installations for buildings at home and abroad. Salary according to qualifications and experience. Write—Barlow, Leslie & Coombes, 5, Catherine Place, London, S.W.1. 936

LONDON contractor requires working foreman. Knowledge of all systems and experienced in supervision of labour for London area. Able to drive. Full details to—Box 883.

ORDER and stock clerk required by progressive electrical wholesaler. Knowledge of the trade essential. Permanent position with good prospects. Apply — Electrowares Ltd., 302, Waterloo Road, London, S.E.1 (Telephone, Waterloo 5271). 914

PIRELLI-GENERAL CABLE WORKS Ltd. require a young electrical engineer of graduate or H.N.C. level for their development dept. Enthusiasm and drive are essential, and further desirable qualifications are a good grounding in mathematics and physics, apprenticeship with an engineering firm, and some test laboratory experience. Applications in writing should be addressed to Works Manager and Chief Engineer, Eastleigh, Hants. 786

REPRESENTATIVE, resident London area, required for TEMCO accessories. Junior appointment for man aged about 25, familiar with electricity board or wholesale trade, willing to spend part time away from home. Car provided. Pension scheme. Applications, stating age, experience, remuneration expected, to—Mr. S. M. Harris, T.M.C.-Harwell (Sales) Ltd., 37, Upper Berkeley Street, London, W.1. 755

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TECHNICAL sales engineer. Engineering and estimating work tor automatic electric motor control gear manufacturers, Altrincham district. State experience, age, particulars.—Box 03, c/o W. H. Smith & Son Ltd., 17, Stamford New Road, Altrincham, Ches. 904

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TELEPHONE sales engineer, experienced and intelligent, reqd. to handle tenders and prepare quotations for public automatic telephone exchange equipment. Practical knowledge of installation or maintenance of similar equipment, with education up to H.N.C. desirable. A competitive salary and prospects, liberal pension scheme, and excellent general conditions. State age, qualifications and experience to — Staff Establishment Officer, Ref. 744/87, Siemens Edison Swan Ltd., Woolwich, London, S.E.18. 811

TRANSFORMER designer / draughtsman. Experienced with units up to 250 kVA. Salary commensurate with experience. Bonus and free housing accommodation to suitable applicant.—Stewart Transformers Ltd., 75, Kilburn Lane, London, W.10. 938

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Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

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ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

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CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists.—Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards. — Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

COIL winding machine for small armatures. —The Rotary Electrical Co. Limited, 40, Spring Street, Sheffield, 3. 800

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FLUORESCENT tubes reconditioned and guaranteed as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks.—The Anglo-American Electrical Company, Bury New Road, Breightmet, Bolton, Lancs. (Telephone, Bolton 7251). 212

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GENERATING sets for sale, petrol, diesel and steam, from 1 kW up to 700 kW. A.C. and D.C. switchboards.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 161

HEAVY twin core cab tyre flex, 248/.018, by J. & P., carries 100 amps. Several hundred yards on drums, unused. Cheap. View—Burleigh, Alpine Works, Empire Way, Wembley (Phone 0211). 903

HOUSE service meters, C. & H., Aron, E.A.C., 20-240 v. A.C., s.-ph., 50 c., 2½ amps., 7s. 6d. each, 1s. 6d. postage; 5 amps., 17s. 6d. — Universal Electrical, 217-221, City Road, London, E.C.1. 37

LANSING Bagnall 2-ton elect. bat. powered pallet trucks, pedest. control, model PP, with chargers; 4 for sale. View—Burleigh, Alpine Wks., Empire Way, Wembley (Phone 0211). 879

MOTOR generator sets and converters, all sizes and voltages from ½ kW up to 500 kW in stock.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

MOTORS, starters, circuit-breakers. Huge stocks of all types, ½ to 300 h.p. Stock list or quote by return.—J. S. Ramsbottom & Co. Ltd., Bow St., Keighley (3774-5-6). 70

NAMEPLATES, engraving, diesinking, stencils. — Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

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PLASTIC bell shades, 6" with 1⅛" hole, 5,000 available at 15s. dozen.—Leighton Warehouse Company, 6, Church Rd., Linslade, Leighton Buzzard (Tel. L.B. 3400). 9159

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. or D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

PREPAYMENT 1s. slot house service meters. —Universal Electrical, 217-221, City Road, London, E.C.1. 36

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switch-holder incorporated is proving itself the most popular unit. Suitable for most fittings. 57s. 6d. each subject. — F. W. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

QUARTERLY Credit Meters, single & poly-phase, 2½-100 amps. From 17/6d. Also D.C. See Television.—Tradex, Surbiton. 171

RECONDITIONED slipring crane motors. Quantity available.—The Rotary Electrical Co. Ltd., 40, Spring St., Sheffield, 3. 801

ROTARY converters in stock, all sizes: enquiries invited.—Universal Electrical, 221, City Road, London, E.C.1. 34

ROTARY crack detectors for testing steel bars.—The Rotary Electrical Co. Limited, 40, Spring Street, Sheffield, 3. 802

SMALL BR screws and nuts in steel, brass and stainless steel, from stock.—Premier Screws & Repetition Co. Ltd., Woodgate, Leicester. 180

TELEVISION slotmeters & Time Switches. Details from: Tradex Meter Co., Surbiton. Elmbridge 4487. 172

TIME switches from stock. Reconditioned or new. 12 months' guarantee. Lists from—J. W. Hughes, 3, St. Thomas Street, London Bridge, London, S.E.1 (Tel. HOP 2759). 178

TWO Bruce Peebles transformers for sale, 250 volts, 8.6 amps., 50 cycles, to 50 volts, 40 amps., single-phase, 2 kVA rated. Oil immersed. Group 1, plus 2, flameproof. Photo, etc., from—F. J. Edwards Limited, 359, Euston Road, London, N.W.1. 863

VENNER time switches, 200-240 v. A.C./D.C., 10-50 amps., from stock.—Universal Electrical Co., 221, City Rd., London, E.C.1. 38

WARD Leonard motor generator sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

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WESTINGHOUSE rectifier with separate transformer, input 400/440/50/3, output 21 amps., 460/480 D.C.—Box 915.

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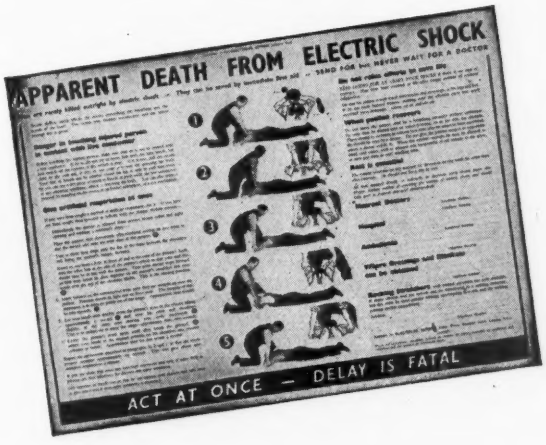

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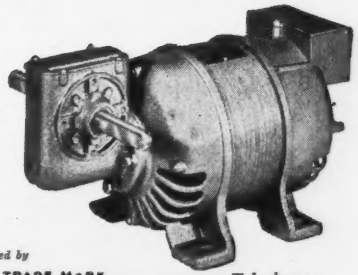

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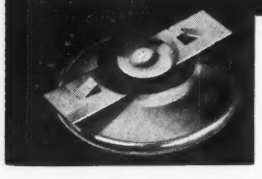

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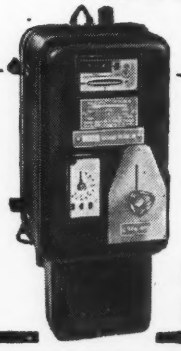

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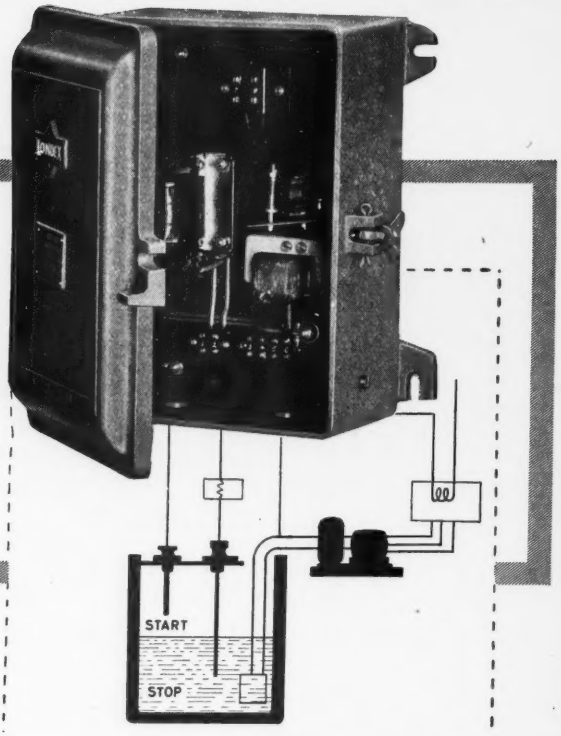

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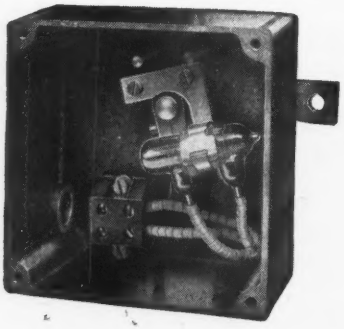

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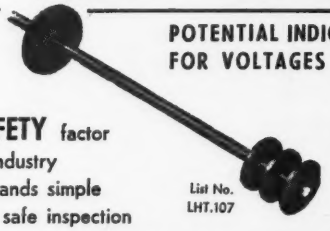

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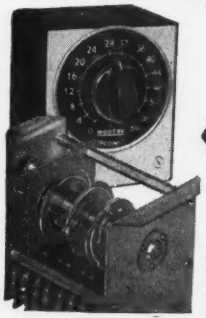

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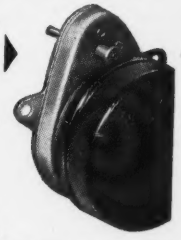

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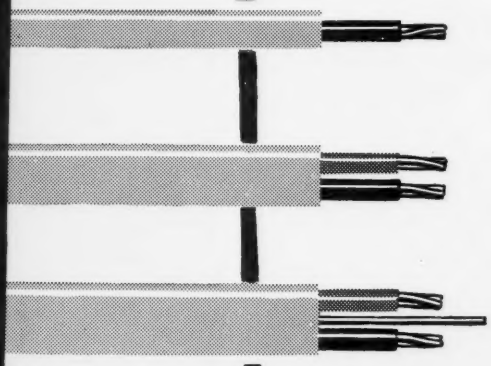

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